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# PETROLEUM CATALOG

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# VISCOSITY


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## Dynamic Viscosity by Bold Series Rotational Viscometer

### Test Method

Determines the dynamic viscosity of a substance by the rotation of a specified spindle within the sample at the speed giving the maximum torque reading on the viscometer. The resulting torque reading is used to calculate the viscosity of the substance.

### Bold Series Rotational Viscometer

- Bold series viscometers allow fast and accurate viscosity readings.
- They are low budget and easy to use.
- Data Displayed
  Selected speed: r.p.m.
  Selected spindle: SP
  Viscosity Reading: cP (mPa·s)
  Percentage of full scale: %
- Relative and absolute viscosity
- Unit converter SI to CGS
- AUTO-TEST with sound and visual malfunction alarm
- AUTO-RANGE function
- User-enabled calibration
- 10 language options
- AISI 316 stainless steel spindles

**Specifications**

Precision: ±1% of full scale
Resolution:
Using low viscosity adapter: 0.01
For lower than 10,000 viscosity cP: 0.1
For viscosity equal to or above 10,000 cP: 1
Repeatability: 0.2%

Electrical Requirements: 100-240V, 50/60Hz
Measuring Range:
Bold Series L: 20-2,000,000 cP
Bold Series R: 100-13,000,000 cP
Bold Series H: 200-106,000,000 cP
Speed: 0.3-100 rpm
Number of Speeds: 18

**Included Accessories**

Standard Spindles
(4 spindles for L model, 6 spindles for R and H models)
Viscometer Stand
Spindle Protector

CE

**Ordering Information**

| Catalog Number | Product Description |
|---|---|
| **2346688** | Bold Series L Rotational Viscometer |
| **2346689** | Bold Series R Rotational Viscometer |
| **2346690** | Bold Series H Rotational Viscometer |

## Dynamic Viscosity by Power Series Rotational Viscometer

### Test Method

Determines the dynamic viscosity of a substance by the rotation of a specified spindle within the sample at the speed giving the maximum torque reading on the viscometer. The resulting torque reading is used to calculate the viscosity of the substance

### Power Series Rotational Viscometer

- Touch key board with 12 keys
- Direct readout on a graphic display
- Data displayed

Selected speed: r.p.m. Selected spindle: SP



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Viscosity reading: cP (mPa·s) or cSt
Percentage of full scale: %
Sample temperature: °C or °F
Shear Rate (with coaxial spindles): SR (s-1)
Shear Stress (with coaxial spindles): SS (N/m2)
Density (introduced by the user): g/cm3
• Unit converter SI to CGS
• Program features:
Time to torque: target torque pre-setting device
Time to stop: target time pre-setting device
10 working memories
Customizable options
Programmable
Multistep
Ramp
• AUTO-TEST with sound and visual malfunction alarm
• AUTO-RANGE function
• Temperature reading by PT100
• User-enabled viscosity and temperature calibration
• 10 language options
• Interface: USB
• Datalogger Software: USB allows data transfer to a PC Excel format
• AISI 316 Stainless steel spindles

CE

### Specifications

Precision: ±1% of full scale
Resolution:
With low viscosity adapter: 0.01
For lower than 10,000 viscosity cP: 0.1
For viscosity equal to or above 10,000 cP: 1
Repeatability: 0.2%
Thermometer features:
0°C to +100°C
32°F to 212.0°F

Resolution: 0.1°C/0.1722°F
Precision: +/- 0.1°C
Type of probe: PT100
Electrical Requirements: 100-240V, 50/60Hz
Measuring Range:
Power Series L: 20-6,000,000 cP
Power Series R: 100-40,000,000 cP
Power Series H: 200-106,000,000 cP
Speed: 0.01-200 r.p.m.
Number of speeds: 54

### Included Accessories

Standard spindles (4 spindles for L model and 6 spindles for R and H models)
Viscometer Stand
Spindle Protector
Carrying Case
USB Cable
Datalogger Software

**Ordering Information**

| Catalog Number | Product Description |
|---|---|
| **2346697** | Power Series L Rotational Viscometer |
| **2346698** | Power Series R Rotational Viscometer |
| **2346699** | Power Series H Rotational Viscometer |

## Dynamic Viscosity by Sharp Series Rotational Viscometer

### Test Method

Determines the dynamic viscosity of a substance by the rotation of a specified spindle within the sample at the speed giving the maximum torque reading on the viscometer. The resulting torque reading is used to calculate the viscosity of the substance.

### Sharp Series Rotational Viscometer

• Indispensable in QC and R&D laboratories.
• Touch key board with 6 keys
• Direct readout on graphic display
• Data displayed



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Selected speed: r.p.m.
Selected spindle: SP
Viscosity reading: cP (mPa·s) or cSt
Percentage of full scale: %
Sample temperature: °C or °F (optional)
Shear rate (with coaxial spindles): SR (s-1)
Shear stress (with coaxial spindles): SS (N/m2)
Density (introduced by the user): g/cm3

- Viscosity reading: dynamic viscosity (cP or mPa·s) or kinematic viscosity (cSt)
- Unit converter SI to CGS
- Program features:
  Time to torque: target torque pre-setting device
  Time to stop: target time pre-setting device
  10 working memories
- AUTO-TEST with sound and visual malfunction alarm
- AUTO-RANGE function
- Temperature reading by PT100 (optional)
- User-enabled viscosity and temperature (optional) calibration
- 10 language options
- Interface: USB
- Datalogger Software: USB allows data transfer to a PC Excel format
- AISI 316 stainless steel spindles

### Specifications

Precision: ±1% of full scale
Resolution:
With low viscosity adapter: 0.01
For lower than 10,000 viscosity cP: 0.1
For viscosity equal to or above 10,000 cP: 1
Repeatability: 0.2%
Thermometer features:
0°C to +100°C
32°F to 212.0°F

Resolution: 0.1°C/0.1722°F
Precision: +/- 0.1°C
Type of probe: PT100
Electrical Requirements: 100-240V, 50/60Hz
Measuring Range:
Power Series L: 20-6,000,000 cP
Power Series R: 100-40,000,000 cP
Power Series H: 200-106,000,000 cP
Speed: 0.01-200 r.p.m.
Number of speeds: 54

### Included Accessories

Standard spindles (4 spindles for L model and 6 spindles for R and H models)
Viscometer Stand
Spindle Protector
Carrying Case
USB Cable
Datalogger Software

### Ordering Information

| Catalog Number | Product Description |
|---|---|
| **2346691** | Sharp Series L Rotational Viscometer |
| **2346692** | Sharp Series R Rotational Viscometer |
| **2346693** | Sharp Series H Rotational Viscometer |

## Dynamic Viscosity by Master Series Rotational Viscometer

### Test Method

Determines the dynamic viscosity of a substance by the rotation of a specified spindle within the sample at the speed giving the maximum torque reading on the viscometer. The resulting torque reading is used to calculate the viscosity of the substance.

### Master Series Rotational Viscometer

- Master Series viscometers, monitored by Master Series Rotational Viscometer Software, offer a wider and unique range of rheological applications.



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- Touch key board with 12 keys
- Direct readout on a graphic display
- Data displayed
  Selected speed: r.p.m.
  Selected spindle: SP
  Viscosity Reading: cP (mPa·s) or cSt
  Percentage of full scale: %
  Sample temperature: °C or °F
  Shear Rate (with coaxial spindles): SR (s-1)
  Shear Stress (with coaxial spindles): SS (N/m2)
  Density (introduced by the user): g/cm3
  Step Program Status
  Analyze & visual characteristics (flow curves)
- Viscosity reading: dynamic viscosity (cP or mPa·s) or kinematic viscosity (cSt)
- Program features:
  Time to torque: target torque pre-setting device
  Time to stop: target time pre-setting device
  10 working memories
  Customizable options
  Programmable
  Multistep
  Ramp
- AUTO-TEST with sound and visual malfunction alarm
- AUTO-RANGE function
- Temperature reading by PT100
- User-enabled viscosity and temperature calibration
- 10 language options
- AISI 316 stainless steel spindles

## Master Series Rotational Viscosity Software

- Complete viscometer control
- Easy to use. All programs eliminate user errors when programming the instrument to collect data.
- Provides instantaneous viscosity flow curves when performing new experiments, with definable parameters
- Clear view of program options using flanges
- Definable graphics and zoom function
- Different types of experiments can be programmed: simple curves, ramps,and multi-step
- All experiments are recorded in different databases to be able to consult them anytime
- Experiment documentation with name, number, and additional data
- In order to compare different flow curves, up to 4 experiments can be plotted simultaneously
- Over 12 different charts can be obtained

The Master Series Rotational Viscosity Software is designed to program the Master Series Viscometer and is a powerful key to document and study the viscosity behavior of fluids. The Master Series Rotational Viscosity Software is capable of graphing simple curves, ramps and “multi-step” curves allowing the user to study trends and the behavior of different materials. A powerful graph key assists the user to easily design flow curves required.

### Specifications

Precision: ±1% of full scale
Resolution:
With low viscosity adapter: 0.01
For lower than 10,000 viscosity cP: 0.1
For viscosity equal to or above 10,000 cP: 1
Repeatability: 0.2%
Thermometer features:
Temperature margins:
0°C to +100°C
32°F to 212.0°F
Resolution: 0.1°C / 0.1722°F
Precision: +/- 0.1°C
Type of Probe PT100
Electrical Requirements: 100-240V, 50/60Hz
Measuring Range:
Master Series L: 20-6,000,000 cP
Master Series R: 100-40,000,000 cP
Master Series H: 200-106,000,000 cP
Speed: 0.01-250 r.p.m.
Number of speeds: 2,600

### Included Accessories

Standard spindles (4 spindles for L model and 6 spindles for R and H models)
Viscometer Stand
Spindle Protector
Carrying Case
USB Cable
Datalogger Software



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| Ordering Information | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2346700** | Master Series L Rotational Viscometer |
| **2346701** | Master Series R Rotational Viscometer |
| **2346702** | Master Series H Rotational Viscometer |
| **2346703** | Master Series L Rotational Viscometer with Software |
| **2346704** | Master Series R Rotational Viscometer with Software |
| **2346705** | Master Series H Rotational Viscometer with Software |

## SV3000/SV4000 Saybolt Viscosity Baths with Automatic Timing Option

### Test Method

Determines the time required for 60mL of sample to flow through a calibrated orifice under precisely controlled conditions. Saybolt Universal Seconds (SUS) is the standard measurement for lubricants, insulating oils, and lighter fuel grades, and Saybolt Furol Seconds (SFS) is used for heavier oils and bitumens.

### Features and Benefits

- Microprocessor control of temperature between ambient and 240°C (464°F)
- Four tube capacity
- Dual digital displays show setpoint and actual temperature
- Selectable temperature scale - Fahrenheit or Celsius
- Automatic timing option for simplified, accurate measurement of efflux times
- Conforms to ASTM D88, D244, E102, and related specifications

### SV3000/SV4000 Saybolt Viscosity Bath

Constant temperature bath with available automatic timing feature for viscosity determinations using Saybolt viscometer tubes and orifices. Microprocessor PID circuitry assures precise temperature control within ASTM specified tolerances throughout the operating range of the bath. Simple push-button controls and dual digital displays permit easy setting and monitoring of bath temperature. Two place calibration offset is provided. Accommodates four viscometers and four 60mL receiving flasks. Sliding draft shields and a chemical-resistant alignment plate facilitate handling of the flasks, and glare-free fluorescent backlighting is provided for easy viewing of the samples. Communications software (RS232, etc.) ramp-to-set, and other enhanced features are available at additional cost.

**Automatic Timing Option** — At the push of a button, the automatic timer starts the sample flow, senses the 60mL end point, and digitally records and displays the efflux time in 0.1 seconds resolution with an accuracy of 0.05%. Automatic timing improves testing accuracy and convenience, eliminating the chain and cork assembly and the need to manually time each sample. Timer installation is available in any configuration from one to four positions.

**Bath Construction and Safety Features** — Insulated bath interior is constructed entirely of heavy gauge stainless steel. A built-in overflow pipe and drain valve simplifies filling of the bath fluid to the proper level. Chemical resistant top plate provides excellent insulation and is easily removed to allow for cleaning of the bath interior. A cooling coil for tap water or refrigerated coolant is provided for operation at near-ambient temperatures. Steel cabinet has leveling feet and a chemical-resistant polyurethane-epoxy finish.

**Specifications**
Conforms to the specifications of: ASTM D88, D244, E102; AASHTO T72; FTM 791-304
Capacity: 4 viscometer tubes
Temperature Range: ambient to 464°F (240°C)
Temperature Stability: ± 0.05°F (± 0.03°C)
Bath Capacity: 5 gal (19L)
Recommended Bath Medium: water or suitable heat transfer fluid

**Electrical Requirements**
115V, 50/60Hz, single phase, 12.3A
220-240V, 50/60Hz, single phase, 6.4A

**Dimensions** lxwxh,in.(cm)
29x25x33 (74x64x84)
Net Weight: 65 lbs (30kg)

**Shipping Information**
Shipping Weight: 82 lbs (37kg)
Dimensions: 10 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **1402009** | SV3000 Saybolt Viscosity Bath | 115V, 50/60Hz Single Phase, 12.3A |
| **2036236** | SV3000 Saybolt Viscosity Bath | 220-240V, 50/60Hz Single Phase, 6.4A |
| **2035202** | SV4000 Saybolt Viscosity Bath for Automatic Viscosity Timing | 115V, 50/60Hz Single Phase, 12.3A |
| **2037182** | SV4000 Saybolt Viscosity Bath for Automatic Viscosity Timing | 220-240V, 50/60Hz Single Phase, 6.4A |

**Accessories**

| Catalog Number | Product Description | Electrical Requirements | Additional Information |
|---|---|---|---|
| **2036741** | Automatic Saybolt Viscosity Timing Sensor | 115V, 50/60Hz | Each port can accommodate one sensor for automatic timing operation on SV4000 Saybolt Viscosity Baths |
| **2037292** | Automatic Saybolt Viscosity Timing Sensor | 220-240V, 50/60Hz | |
| **1794810** | Silicone Heat Transfer Fluid - 1 Gallon Container | | Minimum flash point 620°F (326°C). Order quantity of 5 per bath. |
| **2042824** | Silicone Heat Transfer Fluid - 5 Gallon Container | | Minimum flash point 620°F (326°C). Order quantity of 1 per bath |

## LKV3000/LKV4000/LKV5000 Digital Refrigerated Constant Temperature Kinematic Viscosity Baths

### Test Method
Kinematic viscosity is of primary importance in the design and selection of a wide range of petroleum products. Calibrated capillary viscometers are used to measure flow under gravity or vacuum at precisely controlled temperatures.

### Features and Benefits
- Improved design with enhanced performance and safety features
- Standard -30ºC (-22ºF) LKV3000 model, and extended range -70ºC (-94ºF) LKV4000 model
- Microprocessor PID temperature control with two decimal calibration offset
- Dual digital displays show setpoint and actual bath temperature
- Selectable temperature scale - Fahrenheit or Celsius
- Conforms to ASTM D445, D6074 and related specifications for kinematic viscosity testing

### LKV3000/LKV4000 Refrigerated Constant Temperature Baths
New refrigerated constant temperature bath series with improvements in operating features, safety and cabinetry. Advanced temperature control circuitry includes microprocessor PID design and two decimal calibration offset. Simple push-button controls and dual digital displays permit easy setting and monitoring of bath temperature. Baths accommodate four

capillary viscometers using 2" (51mm) round holders (rectangular ports are available on special order). Bath medium is contained in a clear, evacuated Dewar flask, and glare-free fluorescent backlighting provides excellent visibility when working with the viscometers.

**Standard and Extended Range Models** — Standard LKV3000 model operates at temperatures from ambient to -30ºC (-22ºF). Extended range LKV4000 model operates at temperatures as low as -70ºC (-94ºF). Both models exceed ASTM temperature control accuracy and uniformity requirements throughout the operating range. Air-cooled hermetic compressors provide efficient operation with the use of CFC free refrigerants.

**Bath Construction and Safety Features** — Insulated steel cabinet has an attractive polyester-epoxy finish and is mounted on adjustable leveling feet. Chemical resistant working (top) surface has four round ports for 2" (51mm) viscometer holders and one port for a thermometer holder. Front viewing window provides clear, distortion-free visibility. Microprocessor controller incorporates circuitry that interrupts power to the heater in the event of an over-temperature condition or disconnection of the primary probe. A redundant adjustable controller and sensor probe provide added over-temperature protection, and an integrated low liquid level sensor removes power to the heaters if the bath liquid is not filled to the proper level or falls below during operation. Both over-temperature and low liquid level circuits will latch and prevent further operation of the bath until the fault is removed.

## LKV5000 Refrigerated Constant Temperature Baths with Optical Detection

LKV5000 series kinematic viscosity baths with the optical flow detection system provides automatic viscosity measurements of petroleum and petrochemical products. Includes communication and power ports for each optical detection assembly, and can utilize up to four optical assemblies.

Optical sensors and viscometer tubes to be ordered separately

**Ordering Information**

| Catalog No. | Model | Electrical Requirements | Temperature Range | Net Weight | Shipping Weight |
|---|---|---|---|---|---|
| **1794809** | LKV3000 | 115V, 60Hz Single Phase, 20.1A | 15 to -30°C, 59 to -22°F | 176 lbs (80 kg) | 300 lbs (136 kg) |
| **2037895** | LKV5000 | 115V, 60Hz Single Phase, 20.1A | 15 to -30°C, 59 to -22°F | 176 lbs (80 kg) | 300 lbs (136 kg) |
| **2035972** | LKV3000 | 220-240V, 50Hz Single Phase, 10.6A | 15 to -30°C, 59 to -22°F | 176 lbs (80 kg) | 300 lbs (136 kg) |
| **2035972** | LKV5000 | 220-240V, 50Hz Single Phase, 10.6A | 15 to -30°C, 59 to -22°F | 176 lbs (80 kg) | 300 lbs (136 kg) |
| **1844080** | LKV4000 | 115V, 60Hz Single Phase, 26.9A | 15 to -70°C, 59 to -94°F | 176 lbs (80 kg) | 300 lbs (136 kg) |
| **1844080** | LKV5000 | 115V, 60Hz Single Phase, 26.9A | 15 to -70°C, 59 to -94°F | 176 lbs (80 kg) | 300 lbs (136 kg) |
| **2035210** | LKV4000 | 220-240V, 50Hz Single Phase, 14.5A | 15 to -70°C, 59 to -94°F | 176 lbs (80 kg) | 300 lbs (136 kg) |
| **2035210** | LKV5000 | 220-240V, 50Hz Single Phase, 14.5A | 15 to -70°C, 59 to -94°F | 176 lbs (80 kg) | 300 lbs (136 kg) |

**Specifications**
Conforms to the specifications of: ASTM D445, D2532, D6074, D6158; IP 71; ISO 3104; DIN 51550; FTM 791-305
Testing Capacity: Four (4) glass capillary viscometers
Viscometer Ports: Four (4) round 2" (51 mm) ports
Bath Dimensions: 9.5" dia x 12" deep (24x30cm)
Bath Capacity: 3.7 gal (14 L)
Temperature Control:
Display: 0.1ºC/ºF resolution, calaibrate to 0.01ºC/0.01ºF
Control accuracy and uniformity: Exceeds ASTM requirements throughout the operating range

**Included Accessories**
Four (4) Delrin® viscometer port covers with handles
Thermometer holder

**Dimensions** lxwxh,in.(cm)
42x35x36 (107x89x91)
Net Weight: 176 lbs (80 kg)

**Shipping Information**
Shipping Weight: 300 lbs (136kg)
Dimensions: 42 Cu. ft.

## Digital Constant Temperature Kinematic Viscosity Bath

### Test Method
Kinematic viscosity is of primary importance in the design and selection of a wide range of petroleum products. Calibrated capillary viscometers are used to measure flow under gravity or vacuum at precisely controlled temperatures.

### Features and Benefits
- Accommodates six capillary viscometers
- Variable temperature limit control
- Conforms to ASTM D445 and related specifications

### KV1000 Kinematic Viscosity Baths
Constant temperature bath for kinematic viscosity testing of petroleum products. Accommodates six round 2" (51mm) dia. viscometer holders. Bath temperature stabilizes within ±0.5°C (±1°F) of setting, and final adjustment to within ±0.01°C (±0.02°F) can be made. Test temperatures of up to 150°C (302°F) can be selected. Temperature limit control permits the operator to select an overtemperature cutoff point to protect against accidental overheating. Control unit includes immersion heater, circulating stirrer and temperature probe. Composition top plate rests on a 12x12" (30.5x30.5cm) or 12x18" (30.5x46cm) Pyrex™ jar. Order capillary viscometers, viscometer holders and thermometer separately.

**Specifications**
Conforms to the specifications of:
ASTM D445, D6074, D6158; IP 71; ISO 3104; DIN 51550;
FTM 791-305; NF T 60-100

Capacity: Six (6) glass capillary viscometers
Bath Medium: water or white technical oil

**Included Accessories**
Port Covers, stainless steel (6)

**Ordering Information**

| Catalog No. | Model | Electrical Requirements | Bath Depth | Bath Capacity | Dimensions Idiaxh,in.(cm) | Net Weight |
|---|---|---|---|---|---|---|
| **1844084** | KV1000 | 115V, 50/60Hz Single Phase, 10.2A | 12" (31cm) | 5.8 gal (22 L) | 13.5x20 (34.6x50.8) | 25 lbs (11.3kg) |
| **1844083** | KV1000 | 115V, 50/60Hz Single Phase, 10.2A | 18" (46cm) | 8.9 gal (34 L) | 19.5x23 (49.5x58.4) | 38 lbs (17.2kg) |



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| Catalog No. | Model | Electrical Requirements | Bath Depth | Bath Capacity | Dimensions Idiaxh,in.(cm) | Net Weight |
|---|---|---|---|---|---|---|
| **1844085** | KV1000 | 220-240V, 50Hz Single Phase, 5.3A | 12" (31cm) | 5.8 gal (22 L) | 13.5x20 (34.6x50.8) | 25 lbs (11.3kg) |
| **1844087** | KV1000 | 220-240V, 50Hz Single Phase, 5.3A | 18" (46cm) | 8.9 gal (34 L) | 19.5x23 (49.5x58.4) | 38 lbs (17.2kg) |
| **2037200** | KV1000 | 220-240V, 60Hz Single Phase, 5.3A | 12" (31cm) | 5.8 gal (22 L) | 13.5x20 (34.6x50.8) | 25 lbs (11.3kg) |

| Accessories | |
|---|---|
| **Catalog No.** | |
| **1844086** | Cooling Coil Assembly. Permits circulation of water or refrigerated coolant for operation at near ambient temperatures. Installs in top plate. |

## KV3000 and KV4000 Constant Temperature Kinematic Viscosity Baths with Integrated Digital Timing & Data Acquisition Software

### Test Method

Kinematic viscosity is of primary importance in the design and selection of a wide range of petroleum products. Calibrated capillary viscometers are used to measure flow under gravity or vacuum at precisely controlled temperatures.

### Features and Benefits

- Complete instrument and data acquisition system exclusively designed for conducting D445, D2170 and related test methods
- Powerful software system for PC platforms operating in Windows® 98 SE, 2000, NT, ME, and XP environments
- Microprocessor temperature control between ambient and 150°C (302°F), and down to –20°C (–4°F) with an external chiller
- Integrated digital timing for convenient measurement of sample efflux times
- KV4000 model permits entry of viscometer constants for automatic calculation and display in viscosity units or seconds
- Dual digital displays show setpoint and actual bath temperature
- Selectable temperature scale - Fahrenheit or Celsius
- Integrated redundant over-temperature and low liquid level cut-off circuitry
- Conforms to ASTM D445, D2170 and related specifications for kinematic viscosity testing

## KV3000/KV4000 Kinematic Viscosity Baths

New constant temperature bath series with advanced temperature control circuitry and integrated timing features for convenient, accurate glass capillary viscometry determinations. Microprocessor PID circuitry assures precise, reliable temperature control within ASTM specified tolerances throughout the operating range of the bath. Simple push-button controls and dual digital displays permit easy setting and monitoring of bath

temperature. Two place calibration offset capability is provided. Baths accommodate seven glass capillary viscometers of various types. Viewing the viscometers is made easy by glare-free fluorescent illumination inside the bath and a baffle that provides a background for easy viewing. Temperature control uniformity is assured by means of motorized stirrer which provides complete circulation without turbulence. Connection of the built-in cooling coil to tap water or a recirculating water chiller facilitates temperature control at ambient or below ambient temperatures.

Communications software (RS232, etc.) ramp-to-set, and other enhanced features are available at additional cost. Contact your EXPOTECH USA customer service representative for more information.

**Integrated Timing Features** — KV3000 incorporates seven digital timers on the front control panel for convenient timing and monitoring of the efflux interval for each viscometer. On KV4000, the user can enter the viscosity constant for each viscometer on the front LCD control/display, and then get the test result in both efflux time and viscosity units automatically after stopping each timer. All timing functions on both models are displayed in 0.1 second resolution and are accurate within 0.01%.

**Bath Construction and Safety Features** — Bath chamber is a clear Pyrex vessel enclosed in a polyester-epoxy finished steel housing. Top working surface has seven 2" (51mm) viscometer ports and is constructed of stainless steel for easy cleaning. Front viewing window assures safe, distortion-free viewing. Microprocessor temperature controller incorporates safety circuitry that interrupts power to the heaters in the event of an overtemperature condition or disconnection of the primary probe. For added safety, a redundant adjustable controller with separate sensor probe interrupts power if an overtemperature situation occurs. An integrated low-liquid sensor prevents operation of the bath if the bath liquid is not filled to the proper level, and cuts off power should it fall below during operation. Both overtemperature and low liquid level circuits will latch and prevent further operation of the bath until the fault is removed. Bath rests on adjustable leveling feet. All electronics are mounted on a sliding tray for easy access. Includes thermometer holder and seven plastic port covers with handles.

### Specifications

Conforms to: ASTM D445, D2170, D6074, D6158; IP 71, 319; ISO 3104; DIN 51550; FTM 791-305; NF T 60-100
Temperature Range: ambient to 150°C (302°F); –20°C to 150°C (–4°F to 302°F) with an external chiller

Temperature Display: 0.1°C/0.1°F resolution, calibrate to 0.01°C/0.01°F
Temperature Control Accuracy and Uniformity: Exceeds ASTM requirements throughout the operating range
Integrated Timing:
KV3000 — Seven individual start/stop timers with displays to 0.1 seconds, accurate to within 0.01%
KV4000 — Seven start/stop buttons with integrated LCD display, retention of viscometer constant, automatic calculation and display in viscosity units or seconds to 0.1 seconds accurate to within 0.01%.
Communication: RS232 port included with KV4000 (optional for KV3000)
Viscometer Ports: Seven round 2" (51mm) ports
Bath Medium: Water or suitable heat transfer fluid

### Included Accessories

Port Covers, Delrin® (7)
Thermometer holder

## Viscosity Software

Viscosity Software automatically calculates final test results from sample efflux times and includes a database for logging test data, determining test averages, standard deviations, and ASTM test repeatability. The database also manages information on the complete assortment of viscosity tubes available including type, constants, calibrations, and more. The sophisticated Windows®-based software package features an easy-to-navigate operation, a straightforward user interface, minimal draw on Windows® memory resources, an automatic real-time data acquisition via RS232 connection, and an additional timer / stopwatch feature for general laboratory use. The "test intelligent" software simplifies the process by assisting the operator in performing viscosity tests as per the required tests method. The test results are easily printed in accordance with ISO guidelines, and the final test results are exported with graphs and test analysis to Microsoft® Excel. The software package requires no PC hardware installation and includes the software installation CD and computer connection cable.

**Computer Requirements**
PC Processor: Intel® Pentium II or similar (minimum)
Processor Speed: 500 MHz or higher
Operating System: Windows® 98 SE, 2000, NT, ME, XP

Memory (RAM): 64 Mb RAM (128 Mb RAM recommended)
Hard Disk Space: 15 Mb free space (minimum)
Communication Port: one RS232 port
Other Software: Microsoft® Excel (97 or above)

**Ordering Information**

| Catalog No. | Model | Electrical Requirements | Bath Depth | Bath Capacity | Dimensions lxwxh,in.(cm) | Net Weight |
|---|---|---|---|---|---|---|
| **2037701** | KV3000 | 115V, 50/60Hz Single Phase, 12.6A | 12" (31cm) | 5.8 gal (22 L) | 20x15x24 (51x39x62) | 78 lbs (35.5kg) |
| **2036407** | KV4000 | 115V, 50/60Hz Single Phase, 12.6A | 12" (31cm) | 5.8 gal (22 L) | 20x15x24 (51x39x62) | 78 lbs (35.5kg) |
| **1716052** | KV3000 | 220-240V, 50/60Hz Single Phase, 7.2A | 12" (31cm) | 5.8 gal (22 L) | 20x15x24 (51x39x62) | 78 lbs (35.5kg) |
| **2038025** | KV4000 | 220-240V, 50/60Hz Single Phase, 7.2A | 12" (31cm) | 5.8 gal (22 L) | 20x15x24 (51x39x62) | 78 lbs (35.5kg) |
| **1844088** | KV3000 | 115V, 50/60Hz Single Phase, 12.6A | 18" (46cm) | 8.9 gal (34 L) | 20x15x31 (51x39x77) | 90 lbs (41kg) |
| **2037480** | KV4000 | 115V, 50/60Hz Single Phase, 12.6A | 18" (46cm) | 8.9 gal (34 L) | 20x15x31 (51x39x77) | 90 lbs (41kg) |
| **1844089** | KV3000 | 220-240V, 50/60Hz Single Phase, 7.2A | 18" (46cm) | 8.9 gal (34 L) | 20x15x31 (51x39x77) | 90 lbs (41kg) |
| **2035594** | KV4000 | 220-240V, 50/60Hz Single Phase, 7.2A | 18" (46cm) | 8.9 gal (34 L) | 20x15x31 (51x39x77) | 90 lbs (41kg) |
| **2042853** | Viscosity Software | | | | | |

## KV5000 Kinematic Viscosity Bath with Optical Timing Sensors

KV5000 series kinematic viscosity baths with the optical flow detection system provides automatic viscosity measurements of petroleum and petrochemical products. Includes communication and power ports for each optical detection assembly, and can utilize up to five optical assemblies. Two additional positions are available for manual viscosity measurements, and all positions can be used in the manual mode. The interchangeable Ubbelohde, Cannon® Fenske, and Reverse Flow viscometer tubes are quickly installed and removed from the detection assemblies for cleaning and simple tube changes.

Allows automatic viscosity measurements and results calculation without an external PC. Motorized stirrer provides complete circulation without turbulence. Microprocessor PID circuitry assures precise, reliable temperature control within ASTM specified tolerances throughout the operating range. Simple push-button controls and dual digital displays permit easy setting and monitoring of temperature. Two place calibration offset capability is provided. Built-in cooling coil facilitates temperature control at ambient or below ambient temperatures.

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## Viscosity Software

Software automatically downloads test data and calculates final test results from sample efflux times. Also included is a database for storing test data, determining test averages, standard deviations, and ASTM test repeatability as well as providing a method for tracking both instrument and viscometer tube calibrations.

- Complete instrument and data acquisition system exclusively designed for conducting D445, IP71 and related test methods
- Optical sensor detection system accurately measures sample flow and automatically calculates kinematic viscosity results
- Powerful software system for PC platforms operating in Windows® 98 SE, 2000, NT, ME, and XP environments
- Option wireless data acquisition package available
- Automatic calculation and display of results in viscosity units or seconds
- Accommodates Ubbelohde, Cannon® Fenske, and Reverse Flow viscometers
- High accuracy temperature control with dual digital displays show setpoint and actual bath temperature with selectable scale (°C or °F)
- Stand alone feature provides for automated testing without an external PC
- Integrated redundant overtemperature and low liquid level cut-off circuitry
- Software exports test data with graphs and test parameters direct to Microsoft® Excel or in ASCII file format for use with LIMS or any other spreadsheet program
- Integrated digital timing for easy measurement of sample efflux times

### Specifications

Conforms to the specifications of:
ASTM D445, D2170, D6074, D6158; IP 71, 319; ISO 3104; DIN 51550; FTM 791-305; NF T 60-100
Temperature range: Ambient to 150°C (302°F); sub-ambient to 10°C with external cooling
Temperature display: digital with 0.1 °C/°F resolution, calibrate to 0.01 °C/°F
Temperature control accuracy and uniformity: Exceeds ASTM requirements

### Ordering Information

| Catalog No. | Model | Description | Electrical Requirements | Order Qty |
|---|---|---|---|---|
| **2037607** | KV5000 | 12” Kinematic Viscosity Bath | 115V 50/60Hz | 1 |
| **2037392** | KV5000 | 12” Kinematic Viscosity Bath | 220-240V 50/60Hz | |
| **2038063** | KV5000 | 18” Kinematic Viscosity Bath | 220-240V 50/60Hz | |
| **2036378** | KV5000 | 18” Kinematic Viscosity Bath | 115V 50/60Hz | |
| **2037452** | KV5000 | Kinematic Viscosity Software Package | | 1 |
| **2037961** | | Optical Sensor for CannonÆFenske viscometers | | 1-5 |
| **2038022 thru 2035975** | | Cannon® Fenske Opaque Viscometers Size 25 thru 700 (Specify Size when ordering) | | 1-5 |
| **2036946** | | Optical Sensor for Reverse Flow viscometers | | 1-5) |
| **2037369 thru 2037003** | | Cannon® Fenske Routine Viscometers Size 25 thru 700 (Specify Size when ordering) | | 1-5 |
| **2036314** | | Optical Sensor for Ubbelohde viscometers | | 1-5 |
| **2352453 thru 2352455** | | Ubbelohde Viscometers Size 0 thru 5 (Specify Size when ordering) | | 1-5 |



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# HKV3000 and HKV4000 High Temperature Kinematic Viscosity Baths with Integrated Digital Timing

## Test Method

Kinematic viscosity is of primary importance in the design and selection of a wide range of petroleum products. Calibrated capillary viscometers are used to measure flow under gravity or vacuum at precisely controlled temperatures.

## Features and Benefits

- Microprocessor control of temperature between ambient and 232°C (450°F), and down to –20°C (–4°F) with an external chiller
- Integrated digital timing for convenient measurement of sample efflux times
- HKV4000 model permits entry of viscometer constants for automatic calculation and display in viscosity units or seconds
- Dual digital displays show setpoint and actual bath temperature
- Selectable temperature scale - Fahrenheit or Celsius
- Integrated redundant over-temperature and low liquid level cut-off circuitry
- Conforms to ASTM D445, D2170 and related specifications for kinematic viscosity testing

## HKV3000 and HKV4000 High Temperature Kinematic Viscosity Baths

Constant temperature bath series with advanced temperature control circuitry and integrated timing features for convenient, accurate glass capillary viscometry determinations. Microprocessor PID circuitry assures precise, reliable temperature control within ASTM specified tolerances throughout the operating range of the bath. Simple push-button controls and dual digital displays permit easy setting and monitoring of bath temperature. Two place calibration offset capability is provided. Baths accommodate seven glass capillary viscometers of various types. Viewing the viscometers is made easy by glare-free fluorescent illumination inside the bath and a baffle that provides a background for easy viewing. Temperature control uniformity is assured by means of motorized stirrer which provides complete circulation without turbulence. Connection of the built-in cooling coil to tap water or a recirculating water chiller facilitates temperature control at ambient or below ambient temperatures. Communications software (RS232, etc.) ramp-to-set, and other enhanced features are available at additional cost. Contact your EXPOTECH USA customer service representative for more information.

**Integrated Timing Features** — HKV3000 incorporates seven digital timers on the front control panel for convenient timing and monitoring of the efflux interval for each viscometer. On HKV4000, the user can enter the viscosity constant for each viscometer on the front LCD control/display, and then get the test result in both efflux time and viscosity units automatically after stopping each timer. All timing functions on both models are displayed in 0.01 second resolution and are accurate within 0.01%.

**Bath Construction and Safety Features** — Bath chamber is a clear Pyrex vessel enclosed in a polyester-epoxy finished steel housing. Top working surface has seven 2" (51mm) viscometer ports and is

constructed of stainless steel for easy cleaning. Front viewing window assures safe, distortion-free viewing. Microprocessor temperature controller incorporates safety circuitry that interrupts power to the heaters in the event of an over-temperature condition or disconnection of the primary probe. For added safety, a redundant adjustable controller with separate sensor probe interrupts power if an over-temperature situation occurs. An integrated low-liquid sensor prevents operation of the bath if the bath liquid is not filled to the proper level, and cuts off power should it fall below during operation. Both over-temperature and low liquid level circuits will latch and prevent further operation of the bath until the fault is removed. Bath rests on adjustable leveling feet. All electronics are mounted on a sliding tray for easy access. Includes thermometer holder and seven plastic port covers with handles.

### Specifications

Conforms to the specifications of: ASTM D445, D2170, D6074, D6158; IP 71, 319; ISO 3104; DIN 51550; FTM 791-305; NF T 60-100
Temperature Range: ambient to 232°C (450°F); –20°C to 232°C (–4°F to 450°F) with an external chiller
Temperature Control Display: 0.1°C/°F resolution, calibrate to 0.01°C/0.01°F
Temperature Control Accuracy and Uniformity: Exceeds ASTM requirements throughout the operating range
Integrated Timing:
HKV3000 — Seven individual start/stop timers with displays to 0.01 sec onds, accurate to within 0.01%

HKV4000 — Seven start/stop buttons with integrated LCD display, retention of viscometer constant, automatic calculation and display in viscosity units or seconds to 0.1 seconds, accurate to within 0.01%.
Communication: RS232 port included with HKV4000 (optional for HKV3000)
Viscometer Ports: Seven round 2" (51mm) ports
Bath Medium: Water or suitable heat transfer fluid
Bath Capacity: 5.8 gal (22L)
Bath Depth: 12" (31cm)

**Electrical Requirements**
115V, 50/60Hz, Single Phase, 12.7A
220-240V, 50/60Hz, Single Phase, 7.3A
**Included Accessories**
Port Covers, Delrin® (7)
Thermometer holder
**Dimensions** lxwxh,in.(cm)
20x15x24 (51x39x62)
Net Weight: 83 lbs (38kg)

**Ordering Information**

| Catalog No. | Model | Electrical Requirements | Bath Depth | Bath Capacity | Dimensions lxwxh,in.(cm) | Net Weight |
|---|---|---|---|---|---|---|
| **1794809** | KV3000 | 115V, 50/60Hz Single Phase, 12.7A | 12" (31cm) | 5.8 gal (22 L) | 20x15x24 (51x39x62) | 84 lbs (38 kg) |
| **2035239** | KV4000 | 115V, 50/60Hz Single Phase, 12.7A | 12" (31cm) | 5.8 gal (22 L) | 20x15x24 (51x39x62) | 84 lbs (38 kg) |
| **2036981** | KV3000 | 220-240V, 50/60Hz Single Phase, 7.3A | 12" (31cm) | 5.8 gal (22 L) | 20x15x24 (51x39x62) | 84 lbs (38 kg) |
| **2036041** | KV4000 | 220-240V, 50/60Hz Single Phase, 7.3A | 12" (31cm) | 5.8 gal (22 L) | 20x15x24 (51x39x62) | 84 lbs (38 kg) |

## BV3000 Brookfield Viscosity Liquid Bath

### Test Method

Determines the low temperature, low shear rate viscosities of gear oils, automatic transmission fluids, hydraulic oils and other fluid lubricants by use of the Brookfield viscometer.

### Features and Benefits

- Sample soaking and testing in a single bath, eliminating the need for an air bath and the risk of sample temperature rise during transfer
- Redesigned for improved control of sample movement and handling during testing
- Microprocessor PID temperature control duplicates the sample cooling rates in ASTM D2983
- Up to 40 cooling/testing temperature profiles can be stored in memory
- Redesigned turntable mechanism seals out moisture to minimize ice formation

### BV3000 Brookfield Viscosity Liquid Bath

Constant temperature liquid bath permits testing of samples without the risk of sample temperature rise. After cooling in the air bath, the sample must be transferred to the balsa cell carrier for testing with the Brookfield viscometer. If the sample is not tested quickly, there is the risk of sample temperature rise. The Brookfield Viscosity Liquid Bath eliminates this risk by permitting the sample to be tested in a constant temperature environment. The Brookfield viscometer mounts directly on the bath and the samples are rotated into position under the spindle by means of a built-in turntable. Cooling system maintains temperature with ±0.05°C stability in the range of +10°C to –55°C. Bath temperature is displayed in digital format.

**Specifications**
Conforms to the specifications of: Note 7 of ASTM D2983
Sample Capacity: 10 samples
Temperature Range: +10°C to –55°C
Temperature Control Stability: ±0.05°C

**Electrical Requirements**
115V 60Hz, Single Phase, 16A
220-240V 50 or 60Hz, Single Phase, 12A

**Dimensions** lxwxh,in.(cm)
17x24x25(43x61x25)
Net Weight: 265 lbs (120kg)

**Shipping Information**
Shipping Weight: 300 lbs (136kg)
Dimensions: 13.9 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2035537** | BV3000 Brookfield Viscosity Liquid Bath | 115V 60Hz |
| **2255126** | BV3000 Brookfield Viscosity Liquid Bath | 230V 50Hz |
| **2035192** | BV3000 Brookfield Viscosity Liquid Bath | 230V 60Hz |

**Accessories**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2035577** | Brookfield Digital Viscometer | 115V, 60Hz |
| **2035146** | Brookfield Digital Viscometer | 220-240V, 50Hz |
| **2035490** | Brookfield Digital Viscometer | 220-240V, 60Hz |
| **2037210** | Brookfield Programmable Viscometer | 115V, 60Hz |
| **2035531** | Brookfield Programmable Viscometer | 220-240V, 50Hz |
| **2037203** | Brookfield Programmable Viscometer | 220-240V, 60Hz |
| **2037966** | Insulated Spindle No.4 | |
| **2059223** | Non-Insulated Spindle No.4 | |
| **2038075** | Cell Stopper | |
| **2037183** | Insulated Cell Carrier | |
| **2037288** | Test Cell - Round Bottom | pack of 12 |
| **2037214** | Test Cell - Flat Bottom | pack of 12 |
| **2037411** | ASTM 122C/IP94C Thermometer | Range –45 to –35°C |
| **2037984** | ASTM 123C/IP95C Thermometer | Range –35 to –25°C |
| **2037602** | ASTM 124C/IP96C Thermometer | Range –25 to –15°C |
| **2038158** | ASTM 125C/IP97C Thermometer | Range –15 to –5°C |
| **2036847** | Viscosity Standard N27B | Viscosities in centipoise at –40, –30, –20, –15, –10, 0°F |
| **2036437** | Viscosity Standard N115B | Viscosity in centipoise at –20, –15, –10, 0, +10, +20°F |

## BV4000 Brookfield Viscosity Air Bath

### Test Method
Determines the low temperature, low shear rate viscosities of gear oils, automatic transmission fluids, hydraulic oils and other fluid lubricants by use of the Brookfield viscometer.

### Features and Benefits
- Conforms to ASTM D2983 and related specifications
- Mechanically refrigerated with digital temperature control
- Operating range to –50°C
- Sixteen sample capacity



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## BV4000 Brookfield Viscosity Air Bath

Mechanically refrigerated cold cabinet prepares samples for Brookfield viscosity determinations on petroleum lubricants. A built-in turntable rotates the samples at 4 RPM per specifications. Cooling system maintains cabinet temperature within ±0.1°C at temperatures as low as –50°C. Cabinet temperature is displayed in digital format on the front panel. Cabinet accommodates sixteen (16) sample cells with cell carriers. Includes insulated cover.

### Specifications

Conforms to:
ASTM D2983; IP 267 Method A; ISO 9262; CEC-L-18A
Capacity: Sixteen (16) sample cells with cell carriers
Temperature Range: –10°C to –50°C
Temperature Control Accuracy: ±0.1°C
Sample Rotation: 4 RPM

### Electrical Requirements

115V, 60Hz, Single Phase, 16A
220-240V, 50 or 60Hz, Single Phase, 12A

### Dimensions lxwxh,in.(cm)

36x28x43 (91x71x109)
Net Weight: 315 lbs (143kg)

### Shipping Information

Shipping Weight: 380 lbs (172kg)
Dimensions: 39 Cu. ft.

### Accessories

| Catalog Number | Product Description | Additional Information |
|---|---|---|
| **2035577** | Brookfield Digital Viscometer | 115V, 60Hz |
| **2035146** | Brookfield Digital Viscometer | 220-240V, 50Hz |
| **2035490** | Brookfield Digital Viscometer | 220-240V, 60Hz |
| **2037210** | Brookfield Programmable Viscometer | 115V, 60Hz |
| **2035531** | Brookfield Programmable Viscometer | 220-240V, 50Hz |
| **2037203** | Brookfield Programmable Viscometer | 220-240V, 60Hz |
| **2037966** | Insulated Spindle No.4 | |
| **2059223** | Non-Insulated Spindle No.4 | |
| **2038075** | Cell Stopper | |
| **2037183** | Insulated Cell Carrier | |
| **2037288** | Test Cell - Round Bottom | pack of 12 |
| **2037214** | Test Cell - Flat Bottom | pack of 12 |
| **2037411** | ASTM 122C/IP94C Thermometer | Range –45 to –35°C |
| **2037984** | ASTM 123C/IP95C Thermometer | Range –35 to –25°C |
| **2037602** | ASTM 124C/IP96C Thermometer | Range –25 to –15°C |
| **2038158** | ASTM 125C/IP97C Thermometer | Range –15 to –5°C |
| **2036847** | Viscosity Standard N27B | Viscosities in centipoise at –40, –30, –20, –15, –10, 0°F |
| **2036437** | Viscosity Standard N115B | Viscosity in centipoise at –20, –15, –10, 0, +10, +20°F |



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| Ordering Information | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Electrical Requirements** |
| **2255128** | BV4000 Brookfield Viscosity Air Bath | 115V, 60Hz, 16A |
| **2255130** | BV4000 Brookfield Viscosity Air Bath | 220-240V, 50Hz, 12A |
| **2255129** | BV4000 Brookfield Viscosity Air Bath | 220-240V, 60Hz, 12A |

## BV5000 Programmable Brookfield Viscosity Liquid Bath

### Test Method

Determines the low temperature, low shear rate viscosities of gear oils, automatic transmission fluids, hydraulic oils and other fluid lubricants by use of the Brookfield viscometer.

### Features and Benefits

- Sample soaking and testing in a single bath, eliminating the need for an air bath and the risk of sample temperature rise during transfer
- Redesigned for improved control of sample movement and handling during testing
- Microprocessor PID temperature control duplicates the sample cooling rates in ASTM D2983
- Up to 40 cooling/testing temperature profiles can be stored in memory

### Programmable Brookfield Viscosity Liquid Bath

Redesigned programmable baths with improved features for sample handling and testing. Bath accommodates 10 samples for Brookfield Viscosity testing. Sample cells are immersed in a liquid bath for the entire soaking and testing period, eliminating the need to transfer cells from an air bath to a liquid bath with insulated balsa wood carriers. Also eliminated is the inherent risk of sample temperature rise during transfer. The programmable microprocessor PID controller stores up to 40 temperature profiles that duplicate the sample cooling rates found in ASTM D2983. Steady state temperature accuracy and uniformity exceed ASTM requirements throughout the operating range from ambient to -55°C. Air-cooled hermetic compressors provide efficient operation with the use of CFC-free refrigerants.

The mounting position for the Brookfield Viscometer has been changed to permit easier access to the samples and viscometer controls. Cabinet has a front window and glare-free fluorescent lighting for distortion free viewing of the sample cells. Cabinet construction is polyester-epoxy finished steel with a chemical-resistant composite top surface. A removable insulated cover with handle is included. Bath rests on adjustable leveling feet. Safety features include a probe fault detection circuit in the primary temperature controller and a redundant latching controller and probe for temperature fault protection.

**Specifications**

Conforms to the specifications of:
ASTM D2983 - Note 1 and Appendix X3; IP 267; CEC L18A-30; ISO 9262
Sample capacity: 10 samples
Temperature control: Microprocessor PID digital-indicating programmable controller with ±0.05°C steady state stability
Operating Range: Ambient to –55°C

**Electrical Requirements**

220-240V, 50 Hz, Single Phase, 12.6A
220-240V, 60 Hz, Single Phase, 12.6A

**Dimensions** lxwxh,in.(cm)
41x34x38 (104x86.5x96.5)
Net Weight: 327 lbs (148.5kg)

**Shipping Information**

Shipping Weight: 497 lbs (226kg)
Dimensions: 41.5 Cu. ft.

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| Ordering Information | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Electrical Requirements** |
| **2036345** | BV5000 Programmable Brookfield Viscosity Liquid Bath | 220-240V, 50Hz |
| **2036167** | BV5000 Programmable Brookfield Viscosity Liquid Bath | 220-240V, 60Hz |

| Accessories | | | |
|---|---|---|---|
| **Catalog Number** | **Product Description** | **Additional Information** | **Order Qty** |
| **2035577** | Brookfield Digital Viscometer | 115V, 60Hz | 1 |
| **2035146** | Brookfield Digital Viscometer | 220-240V, 50Hz | |
| **2035490** | Brookfield Digital Viscometer | 220-240V, 60Hz | |
| **2037210** | Brookfield Programmable Viscometer | 115V, 60Hz | 1 |
| **2035531** | Brookfield Programmable Viscometer | 220-240V, 50Hz | |
| **2037203** | Brookfield Programmable Viscometer | 220-240V, 60Hz | |
| **2037966** | Insulated Spindle No.4B2 | | 1 |
| **2059223** | Non-Insulated Spindle No.4 | | |
| **2038075** | Cell Stopper | | 12 |
| **2037183** | Insulated Cell Carrier (For Air Bath) | | 1 |
| **2037288** | Test Cell - Round Bottom | pack of 12 | 1 |
| **2037214** | Test Cell - Flat Bottom | pack of 12 | 1 |
| **2037411** | ASTM 122C/IP94C Thermometer | Range –45 to –35°C | 1 |
| **2037984** | ASTM 123C/IP95C Thermometer | Range –35 to –25°C | 1 |
| **2037602** | ASTM 124C/IP96C Thermometer | Range –25 to –15°C | 1 |
| **2038158** | ASTM 125C/IP97C Thermometer | Range –15 to –5°C | 1 |
| **2036847** | Viscosity Standard N27B | Viscosities in centipoise at –40, –30, –20, –15, –10, 0°F | 1 |
| **2036847** | Viscosity Standard N115B | Viscosity in centipoise at –20, –15, –10, 0, +10, +20°F | 1 |

## BVS5000 Low Temperature Viscosity by Rotational Viscometer System

### BVS5000 Programmable Brookfield Viscosity Liquid Bath System

- Sample soaking and testing in a single bath, eliminating the need for an air bath and the risk of sample temperature rise during transfer
- Redesigned for improved control of sample movement and handling during testing
- Microprocessor PID temperature control duplicates the sample cooling rates in ASTM D2983
- Up to 40 cooling/testing temperature profiles can be stored in memory

Redesigned programmable baths with improved features for sample handling and testing. Bath accommodates 10 samples for Dynamic Viscosity testing. Sample cells are immersed in a liquid bath for the entire soaking and testing period, eliminating the need to transfer cells from an air bath to a liquid bath with insulated balsa wood carriers. Also eliminated is the inherent risk of sample temperature rise during transfer.

The programmable microprocessor PID controller stores up to 40 temperature profiles that duplicate the sample cooling rates found in ASTM D2983. Steady state temperature accuracy and uniformity exceed ASTM requirements throughout the operating range from ambient to -55°C. Air-cooled hermetic compressors provide efficient operation with the use of CFC-free refrigerants. The mounting position for the Rotational Viscometer has been changed to permit easier access to the samples and viscometer controls. Cabinet has a front window and glare-free fluorescent lighting for distortion free viewing of the sample cells. Cabinet construction is polyester-epoxy finished steel with a chemical-resistant composite top surface. A removable insulated cover with handle is included. Bath rests on adjustable leveling feet. Safety features include a probe fault detection circuit in the primary temperature controller and a redundant latching controller and probe for temperature fault protection.

**Specifications**

Conforms to the specifications of:
ASTM D2983 - Note 2 and Note 10; IP 267; CEC L18A-30; ISO 9262
Sample capacity: 10 samples
Temperature control: Microprocessor PID digital-indicating programmable
controller with ±0.05°C steady state stability
Operating Range: ambient to –55°C

**Electrical Requirements:**

220-240V 50 or 60Hz, Single Phase, 12.6A

**Dimensions** lxwxh,in.(cm)
41x34x38 (104x86.5x96.5)
Net Weight: 327 lbs (148.5kg)

**Shipping Information**

Shipping Weight: 497 lbs (226kg)
Dimensions: 41.5 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2036345** | BVS5000 Programmable Brookfield Viscosity Liquid Bath System | 220-240V 50Hz |
| **2036167** | BVS5000 Programmable Brookfield Viscosity Liquid Bath System | 220-240V 60Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2346688** | Rotational Viscometer, Bold Series L 100-240V 50/60Hz |
| **2346697** | Rotational Viscometer, Power Series L 100-240V 50/60Hz |
| **2037966** | Insulated Spindle No.4B2 |
| **2346747** | L4 Spindle |
| **2035276** | Cell Stopper (For K34706 Only) |
| **2038075** | Cell Stopper |
| **2038021** | Spindle Support Clips |
| **2037183** | Insulated Cell Carrier (for Air Bath) |
| **2037288** | Test Cell - Round Bottom (pack of 12) |
| **2037214** | Test Cell - Flat Bottom (pack of 12) |
| **2037411** | ASTM 122C/IP94C Thermometer Range –45 to –35°C |
| **2037984** | ASTM 123C/IP95C Thermometer Range –35 to –25°C |
| **2037602** | ASTM 124C/IP96C Thermometer Range –25 to –15°C |
| **2038158** | ASTM 125C/IP97C Thermometer Range –15 to –5°C |
| **2036847** | Viscosity Standard N27B Viscosities in centipoise at –40, –30, –20, –15, –10, 0°F |
| **2036437** | Viscosity Standard N115B Viscosity in centipoise at –20, –15, –10, 0, +10, 20°F |



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## Viscometer Cleaning and Drying Apparatus

### Features and Benefits
- Six tube capacity
- For all types of capillary viscometers

### Viscometer Cleaning and Drying Apparatus
Cleans and dries glass capillary viscometers using solvent and pressurized filtered air. Use for all types of kinematic viscometers. Cleans as many as six tubes at a time. Place tubes on solvent/air jets and open the valve for each jet. Turn selector dial to 'solvent' to rinse tubes, and then to 'air' to evaporate any remaining solvent. Use adjustable drainage rack to drain excess sample oil from tubes prior to cleaning. Drainage trough connects to a suitable waste container or chemical drain for removal of waste oil and solvent. Built-in air filter removes particles from the air stream. Available solvent tank has tubing with fittings for connection to apparatus. Requires pressurized air source (150psi maximum).

**Dimensions** lxwxh,in.(cm)
without solvent tank
16x7x12.5 (40.6x17.8x31.7)
Net Weight:
1408117: 34 lbs (15.4kg)
1844117: 15 lbs (6.8kg)

**Shipping Information**
Shipping Weight:
1408117: 44 lbs (20kg)
1844117: 18 lbs (8.2kg)
Dimensions:
1408117: 8.2 Cu. ft.
1844117: 2.6 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description |
|---|---|
| 1408117 | Viscometer Cleaning and Drying Apparatus with Solvent Tank |
| 1844117 | Viscometer Cleaning and Drying Apparatus without Solvent Tank |

## Viscometer Holders

- For use with glass capillary viscometer

**Ordering Information**

| Round Holder Catalog No. | Viscometer Type |
|---|---|
| 1186686 | CannonÆ-Fenske Routine, CannonÆ-Fenske Opaque, CannonÆ-Manning Semi-Micro |
| 1186687 | Ubbelohde |
| 1186688 | CannonÆ-Ubbelohde, CannonÆ-Ubbelohde Semi-Micro 1186688 (Also - Dilution and Semi-Micro Dilution types) |
| 2037570 | Cross-Arm |
| 2037997 | BS/IP/RF U-Tube |
| 2036343 | CannonÆ-Manning Vacuum, Asphalt Institute |
| 2035211 | Modified Koppers |



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## High Temperature Viscometer Holders

• For use with HKV baths for temperature up to 232°C (450°F)

**Ordering Information**

| Round Holder Catalog No. | Viscometer Type |
|---|---|
| 2346789 | Cannon® -Fenske Routine, Cannon® -Fenske Opaque, Cannon® -Manning Semi-Micro |
| 2346790 | Ubbelohde |

## Universal Tube Holders

Can be used interchangeably with Cannon®-Fenske, Cannon®-Manning, Cross-Arm and Ubbelohde type capillary viscometers.

Choice of round (2" dia.) plastic holders or rectangular metal holders.

**Ordering Information**

| Catalog No. | |
|---|---|
| 2037757 | Universal Viscometer Holder, Round |
| 1717960 | Universal Viscometer Holder, Rectangular |

## Digital Stopwatch

ï Accurate to 0.0003%
ï Calibration certificate traceable to NIST
Solid-state LCD digital stopwatch with a full range of features, including single action timing, cumulative split, interval split and more. Housed in a rugged high impact case with 40" (102cm) lanyard. Supplied with 4-year battery and calibration certificate traceable to NIST.

**Ordering Information**

| Catalog No. | |
|---|---|
| 2035968 | Digital Stopwatch |

## Bath Oil

ï White mineral oil for routine applications
ï Silicone fluid for high temperature applications

**White Mineral Oil**ñHighly refined white technical oil for use in constant temperature baths. Contains an oxidation inhibitor to limit clouding at higher temperatures. Suitable for use at temperatures of up to 230ƒF (110ƒC).

**Silicone Fluid**ñ Clear heat transfer fluid with high oxidation resistance and low volatility. Recommended for constant temperature bath applications above 240ƒF (116ƒC).

**Specifications**

| | White Mineral Oil | Silicone Fluid |
|---|---|---|
| Nominal Viscosity | 14.2-17.0 cSt @ 40ƒ | 100 cSt @ 25°C |
| Minimum Flash Point | 248°F (120°C) | 600°F (316°C) |
| Specific Gravity @ 25°C | 0.839-0.855 | 0.964 |

**Ordering Information**

| Catalog No. | |
|---|---|
| 1795640 | White Mineral Oil, 1 Gallon Container |
| 2042823 | White Mineral Oil, 5 Gallon Container |
| 1794810 | Silicone Heat Transfer Fluid, 1 Gallon Container |
| 2042824 | Silicone Heat Transfer Fluid, 5 Gallon Container |

# PENETRATION TESTING EQUIPMENT


• Penetrometer.....24

• Digital Penetrometer & Data Acquisition Software.....25

• Penetrometer Cones, Needles, and Accessories.....27

• Penetrometer Bath.....29

• Grease Worker.....30

## Penetrometer

### Test Method

Penetration tests are performed on petroleum products to determine consistency and shear stability (lubricating greases) for design, quality control and identification purposes. A standard cone or needle is released from a penetrometer and allowed to drop freely into the sample for 5 seconds (or a different specified interval) at constant temperature. The depth of penetration of the cone or needle into the sample is measured in tenths of a millimeter by the penetrometer.

### Features and Benefits

- Conforms to ASTM and related specifications for penetrometers
- Suitable for laboratory or field use

### Penetrometer

Designed for ASTM penetration tests on petroleum products and for consistency tests on a wide range of food products, cosmetics, pastes and other solid to semisolid products. Precision machined and assembled to exacting specifications, and ruggedly constructed to insure long service life in both laboratory and field applications. Features a full penetration range of 0-62.0mm with 1/10mm subdivisions (0-620 penetration scale). Accommodates cones and needles to perform all of the ASTM tests on lubricating greases, asphalts, petroleum waxes and petrolatums. Compact design facilitates transport for field use. Head assembly adjusts for accurate placement of the tip of the needle or cone on the surface of the sample. Sturdy cast iron base provides excellent support and has a built-in spirit level and leveling screws to insure proper alignment of the penetrometer during testing. Supplied with 50 and 100 gram weights and standard 47.5g plunger assembly. Order test cones, needles and lightweight plunger (where applicable) separately.

Conforms to:

ASTM D5, D217, D937, D1321, D1403, D2884, D4950; IP 49, 50, 179, 310; ISO 2137; DIN 51804, 51580, 51579; FTM 791-311, 791-312, 791-313; AOCS Cc 16-60; AACC 58-14; NF T 60-119; 60-123; 60-132; 66-004

CE

**Included Accessories**
Plunger, 47.5g
Weights, 50 and 100g

**Dimensions** lxwxh,in.(cm)
6x6x18 (15x15x46)
Net Weight: 12 lbs (5.4kg)

**Shipping Information**
Shipping Weight: 15 lbs (6.8kg)
Dimensions: 1.7 Cu. ft

**Ordering Information**

| Catalog Number | Product Description |
|---|---|
| 1865162 | Penetrometer |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| 2038243 | Plunger, 15g. For use with 1865165, 2037521, and 2037890 Cones |
| 2036675 | Plunger, 6.9g. For use with 2035186 Cone |
| 2036859 | Plunger, 47.5g |
| 2035345 | Auxiliary Weight Set. Includes one each 2.5g, 5g and 10g weights and two 20g weights |
| 2036876 | Loading Weight, 50g |
| 2036300 | Loading Weight, 100g |

## Digital Penetrometer & Data Acquisition Software

### Test Method

Penetration tests are performed on petroleum products to determine consistency and shear stability (lubricating greases) for design, quality control and identification purposes. A standard cone or needle is released from a penetrometer and allowed to drop freely into the sample for 5 seconds (or a different specified interval) at constant temperature. The depth of penetration of the cone or needle into the sample is measured in tenths of a millimeter by the penetrometer.

### Features and Benefits

- Tests the consistency of lubricating greases, petroleum waxes, bitumens, pastes, creams and other solid to semi-solid products
- Automatically timed operator programmable penetration measurements
- Motorized placement of penetrator on sample surface
- Large LCD to display all functions
- RS232 port for data transfer
- Full measurement range of 0-620 in 1/10mm scale or 1/100mm scale
- Rechargeable battery or AC operation
- Large, removable base accommodates grease worker cups and other ASTM and non-standard sample containers
- Complete selection of penetrometer cones, needles and accessories for petroleum products testing and for a wide range of other applications
- Conforms to all ASTM, IP, ISO 9001 and related specifications for penetrometers

## Microprocessor-Based Digital Penetrometer

A new microprocessor based penetrometer loaded with advanced features to provide ease of operation and highly reproducible consistency measurements of petroleum products. Microprocessor control provides a full range of measurement and reporting options, and operation is simplified by four user programmable presets that facilitate lowering the penetrator tip to the sample surface

**Automatically timed penetrations**—The penetrometer defaults to the standard ASTM interval of 5.0 seconds, or the operator may conveniently program a different interval in the range between 0.1 and 9999.9 seconds (in 0.1 second increments). A curing or temperature stabilization period may also be programmed by the operator (to delay the release of the penetrator into the sample) and for added convenience all selected parameters are retained in memory and automatically repeated in subsequent tests until changed by the operator. Separate keypad controls for each parameter simplify operation. Penetration and delay intervals count down on a large, easy to read LCD on the head of the unit.

**Convenient measurement and reporting options**—Penetration measure-ments in the full range of 0 - 620 in 1/10mm scale are reported in either 1/10mm or 1/100mm increments at the operator's option. For quality control testing, a penetration range can be entered into memory prior to testing. If a test result falls outside of the programmed range, an audible signal and visual error message alert the operator of a failed sample. Test results are displayed in digital format on a large LCD readout on the head of the penetrometer and can be communicated to a printer or computer via a built-in RS232 interface.

**Simplified penetrator tip placement**—Correct placement of the penetrator tip on the sample surface is essential for accurate penetration test results. The Digital Penetrometer has four operator programmable presets that lower the penetrator to the sample surface height at the touch of a button, greatly simplifying the process to ensure reproducibility. A fine adjustment button permits slight adjustments as needed. Full manual operation is also available with the use of coarse and fine push button controls and built-in magnifier and illuminator arms. When testing electrically conductive samples, a built-in circuit senses the sample surface for automatic placement. After testing, the penetrometer head returns to a raised position at the touch of a button to facilitate cleaning of the penetrator and changing of the sample.

**More convenience features**—The detachable machined base provides a large platform to accommodate a wide range of sample containers and constant temperature cylinders. It removes easily to permit the head assembly to be reversed (for use with a constant temperature bath) or mounted directly to a bath housing or other location. A built-in rechargeable battery pack permits field operation and provides back-up in the event of power interruption. Battery recharges automatically during operation of the penetrometer on standard AC electrical service.

**Specifications**
Conforms to the specifications of: ASTM D5, D217, D937, D1321, D1403, D2884, D4950; IP 49, 50, 179, 310; ISO 2137; DIN 51804, 51580, 51579; FTM 791-311, 791-312, 791-313; AOCS Cc 16-60; AACC 58-14; NF T 60-119; 60-123; 60-132; 66-004
Penetration Range: 0-62.0mm (0-620 penetration scale) in 1/10mm or 1/100mm
Penetration Interval: Operator variable from 0.1 to 9999.9 seconds with automatic repeat function and 5.0 second default

**Included Accessories**
Standard Plunger, 47.5g
Weights, 50 and 100g
**Dimensions** lxwxh,in.(cm)
Base: 12.5x14 (31.7x35.6)
Overall: 12.5x14x18 (31.7x35.6x45.7)
Net Weight: 35 lbs (15.9kg)
**Shipping Information**
Shipping Weight: 27 lbs (12.3kg)
Dimensions: 2 Cu. ft.

## Penetrometer Software

Penetrometer Software automatically retrieves complete test parameters and final results on each penetration test for hands-free data acquisition. In addition, the software will determine test averages, standard deviations, and ASTM test repeatability as well as maintain instrument and accessory calibration information. Yield stress values are calculated as per ASTM D2884, and full penetration values (ASTM D217) are automatically determined from the 1/4 and 1/2 scale ASTM D1403 tests. The sophisticated Windows® -based software package features an easy-to-navigate operation, a straightforward user interface, minimal draw on Windows® memory resources, an automatic real-time data acquisition via RS232 connection, and a timer / stopwatch feature for general laboratory use. The “test intelligent” software simplifies the process by automatically choosing the standard test parameters when selecting a specific penetration ASTM method. These default values are easily changed by the user. The test results are easily printed in accordance with ISO guidelines. The software package requires no PC hardware installation and includes the software installation CD and computer connection cable.

**Computer Requirements**
PC Processor: Intel® Pentium II or similar (minimum)
Processor Speed: 500 MHz or higher
Operating System: Windows® 98 SE, 2000, NT, ME, XP
Memory (RAM): 64 Mb RAM (128 Mb RAM recommended)
Hard Disk Space: 15 Mb free space (minimum)
Communication Port: one RS232 port
Other Software: Microsoft® Excel (97 or above)

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **1402109** | Digital Penetrometer | 115V, 50/60Hz |
| **1402110** | Digital Penetrometer | 220-240V, 50/60Hz |
| **2251615** | Penetrometer Software | |

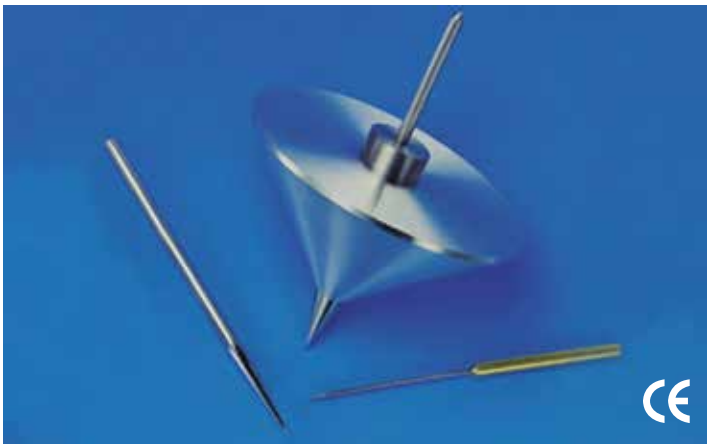
**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2025320** | Calibration Kit. Consists of 0.500, 1.000, and 2.000” gauge blocks with calibration certificate traceable to NIST |
| **2037959** | Plunger, 15g. For use with 1865165, 2037521, and 2037890 Cones |
| **2035527** | Plunger, 6.9g. For use with 2035186 Cone |
| **2305331** | Standard Plunger, 47.5g |
| **2025321** | Loading Weight, 50g |
| **2025322** | Loading Weight, 100g |

## Penetrometer Cones, Needles, and Accessories

### Features and Benefits

- Precision machined cones and needles for ASTM and related methods
- Sample containers
- Constant temperature baths
- Grease workers and accessories
- Roll stability testers
- USDA and AOCS penetrometer cones



## Needle Penetration of Petroleum Waxes

| Test Method Standards ASTM D1321; IP 376; DIN 51579 | |
|---|---|
| **Catalog Number** | **Product Description** |
| **1186677** | Needle, Stainless Steel, 2.5g. |
| **1186678** | Needle, Stainless Steel, 2.5g NIST Certified. |
| **1793482** | Wax Specimen Container Brass cylinder with base plate conforming to ASTM D1321 specifications. |
| **1844177** | Penetration Bath, 115V 60Hz. |
| **1844178** | Penetration Bath, 230V 50Hz. |
| **2059178** | Penetration Bath, 230V 60Hz. |

| Test Method Standards ASTM D5; IP 49; DIN 52010 | |
|---|---|
| **Catalog Number** | **Product Description** |
| **1454308** | Needle - Stainless steel with brass ferrule, 2.5g. |
| **1186680** | Needle - Similar to 1454308, NIST certified, 2.5g. |
| **2037232** | Needle - Stainless steel with stainless steel ferrule, 2.5g. |
| **2035083** | Needle - Similar to 1717522, NIST certified, 2.5g. |
| **2035182** | Sample Container - 55mm dia. x 35mm depth for penetrations below 200. |
| **2036820** | Sample Container - 70mm dia. x 45mm depth for penetrations between 200 to 350. |
| **2036902** | Transfer Dish - Submerges sample container per ASTM specifications. |
| **1844177** | Penetration Bath, 115V 60Hz. |
| **1844178** | Penetration Bath, 230V 50Hz . |
| **2059178** | Penetration Bath, 230V 60Hz . |



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## Cone Penetration of Lubricating Greases

| Test Method Standards ASTM D217; IP 50; ISO 2137; DIN 51804; FTM 791-311, FTM 791-313 | |
|---|---|
| **Catalog Number** | **Product Description** |
| **1186681** | Cone, Magnesium - With hardened stainless steel tip, 102.5g. Standard cone per ASTM D217. |
| **1865164** | Cone, Brass - With hardened stainless steel tip, 102.5g. Optional cone per ASTM D217. |
| **1844070** | Grease Worker series - See 1844070 for specifications and ordering information. |
| **2035118** | Grease Cutter - For 'block penetration' tests. |
| **1844177** | Penetration Bath, 115V 60Hz. |
| **1844178** | Penetration Bath, 230V 50Hz. |
| **2059178** | Penetration Bath, 230V 60Hz. |

## Cone Penetration of Petrolatum

| Test Method Standards ASTM D937; IP 179; ISO 2137; DIN 51580 | |
|---|---|
| **Catalog Number** | **Product Description** |
| **1186681** | Cone, Magnesium - With hardened stainless steel tip, 102.5g. |
| **2035762** | Sample Container - With cover, conforms to ASTM D937 specifications. |
| **1844177** | Penetration Bath, 115V 60Hz. |
| **1844178** | Penetration Bath, 230V 50Hz. |
| **2059178** | Penetration Bath, 230V 60Hz |

## Cone Penetration of Lubricating Greases Using One-Quarter and One-Half Scale Cone Equipment

| Test Method Standards ASTM D1403; IP 310; ISO 2137; DIN 51804 | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2035186** | Quarter-Scale Cone, Aluminum, 2.48g. |
| **2035527** | Plunger, 6.9g - For use with 2025316 series Digital Penetrometer. |
| **2036675** | Plunger, 6.9g - For use with 1865162 series Penetrometer. |
| **2036027** | Quarter-Scale Grease Worker - Consists of cup and cover assembly with plunger plate, shaft, handle, and valve. |
| **2059207** | Retaining Base Plate - Mounts on bench or wall to retain Quarter-Scale Grease Worker when working heavy greases. |
| **2059230** | Blank Lid - With seal, for Quarter-Scale Grease Worker. Use when heating samples prior to test. |
| **1865165** | Half-Scale Cone, Stainless steel, 22.5g. |
| **2037959** | Plunger, 15g - For use with 2025316 series Digital Penetrometer. |
| **2038243** | Plunger, 15g - For use with1865162 Penetrometer. |
| **2035618** | Half-Scale Grease Worker. |
| **1844177** | Penetration Bath, 115V 60Hz. |
| **1844178** | Penetration Bath, 230V 50Hz . |
| **2059178** | Penetration Bath, 230V 60Hz . |

## Roll Stability of Lubricating Greases

| Test Method Standards ASTM D1831 | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2035172** | Roll Stability Tester series, 2036451. |
| **2035186** | Cone Penetration Test Equipment, One-Quarter or One-Half Scale Series. |

## Additional Penetration Cones

| Test Method Standards ASTM D1831 | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2037521** | Magensium Cone, 15g - For ASTM D2884 testing of Heterogeneous Propellants. |
| **1340210** | Aluminum Cone, 45g - For AOCS CC 16-60 testing of fats, butter, margarine. |
| **2037948** | Aluminum Cone, 35g - For USDA testing of pastes. |
| **2037890** | Aluminum Micro-Cone, 5g - For lubricating greases, cosmetic creams. Use together with 2038089 Sample Cup and Collar. |

## Penetrometer Bath

### Features and Benefits

- Conforms to ASTM and related specifications
- Conditions petroleum samples and others requiring close temperature control prior to or during testing
- For use with manual and microprocessor penetrometer models
- Digital temperature control with low-liquid and overtemperature safety cut off

### Penetrometer Bath

Constant temperature water bath for conditioning samples prior to a penetration test. Full visibility bath has a large shelf to accommodate a wide range of sample containers, including all containers used in ASTM tests. Sample containers can be left in the bath during the penetration test if required. The base of the penetrometer can be placed directly on the shelf of the bath, or the head assembly of the digital automatic model can be reversed to overhang the bath. Microprocessor digital temperature control maintains bath liquid temperature with ±0.05°C stability throughout the operating range. A large LED provides bath temperature readout in switchable °C/°F format and a dual-speed circulating pump assures temperature uniformity. The bath is protected by a separate adjustable overtemperature thermostat and a low liquid cut-off. A built-in cooling coil is provided for circulating a refrigerated coolant or tap water if needed.

**Specifications**
Conforms to: ASTM D5, D217, D937, D1403, D1321, D2884
Temperature Range: Ambient to 70°C
Temperature Stability: 0.05°C (0.1°F)

**Optional SS Tank Available**

CE

**Electrical Requirements**
115V 60Hz, Single Phase, 9A
220-240V 50/60Hz, Single Phase, 4.5A

**Dimensions** lxwxh,in.(cm)
18x13.1x8.5 (45.7x33x21.6)
Net Weight: 6 lbs (2.7kg)

**Shipping Information**
Shipping Weight: 10 lbs (4.5kg)
Dimensions: 1.2 Cu. ft.



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| Ordering Information | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Electrical Requirements** |
| **1844177** | Penetrometer Bath | 115V, 50/60Hz |
| **1844178** | Penetrometer Bath | 230V, 50Hz |
| **2059178** | Penetrometer Bath | 230V, 60Hz |

| Accessories | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Temperature Range** |
| **2035906** | ASTM 17F Thermometer | 66 to 80°F |
| **2035696** | ASTM 17C Thermometer | 19 to 27°C |
| **2037140** | ASTM 63F Thermometer | 18 to 89°F |
| **2035138** | ASTM 63C Thermometer | -8 to +32°C |
| **2035819** | ASTM 64F Thermometer | 77 to 131°F |
| **2036538** | ASTM 64C Thermometer | 25 to 55°C |

## Grease Worker

### Features and Benefits

- Conforms to ASTM D217 and related specifications
- Mechanical and manually operated types
- Single and double-unit models

### Grease Worker Mechanical Grease Workers –

For "worked penetration" and "prolonged worked penetration" tests to determine consistency of lubricating greases. Consists of single or dual steel ASTM grease workers mounted on a sturdy base and driven by a powerful gear reduction motor. Meets ASTM specifications for stroke length and rate. Equipped with a presetting electronic counter that automatically shuts off the drive motor after any desired number of strokes up to 99,999. Steel grease workers have threaded cup and cover, and steel plunger plate with shaft and handle that connects to eccentric cam on drive unit. Accessory dial thermometer inserts in plated vent cock. Spring loaded tightening clamps hold grease workers securely on base, and steel pins in base facilitate disassembly of grease workers after testing.

### Manually Operated Grease Worker–

Hand lever operated grease working machine designed for short duration ''worked penetration" tests on lubricating greases. Consists of one steel ASTM grease worker with hand lever mechanism mounted on a sturdy steel base. Spring loaded tightening clamps hold grease worker securely on base, and steel pins in hand lever upright support facilitate disassembly of grease worker. Base plate is drilled at corners to allow for bolting to table top.

**Specifications**

Conforms to: ASTM D217, D4950; IP 50; ISO 2137; DIN 51804; FTM 791-311, 791-313*

*Requires substitution of 270-hole grease worker (2036303)

Drive Motor: fan cooled gear reduction type, 1/3hp (single-unit model) or 1/2 hp (dual-unit model)

**Electrical Requirements**
Mechanical Grease Workers:
115V 60Hz, Single Phase, 3A
220-240V 50/60Hz, Single Phase, 1.5A

**Included Accessories**
Mechanical ASTM Steel Grease Worker (1 or 2)

**Dimensions**: lxwxh,in.(cm)
Mechanical Grease Workers:
Single-Unit: 10x13.5x14.75 (25x34x37)
Double-Unit: 14x13.5x14.75 (36x34x37)

Manually Operated Grease Worker: 30x10x15.5 (76x25x39)
Net Weight:
Mechanical Single-Unit. 106 lbs (48.1kg)
Mechanical Double-Unit: 139.5 lbs (63.3kg)
Manual: 21 lbs (9.6kg)

**Shipping Information**
Shipping Weight: Single-Unit: 141 lbs (64.0kg)
Mechanical Double-Unit: 171 lbs (77.6kg)
Manual: 28 lbs (12.7kg)
Dimensions: Mechanical: 4.2 Cu. ft.; Manual: 2.7 Cu. ft.

**Ordering Information -** Mechanical Grease Workers

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **1844070** | Single-Unit Model | 115V 60Hz |
| **1844070** | Single-Unit Model | 220-240V 50Hz |
| **1844072** | Single-Unit Model | 220-240V 60Hz |
| **1844073** | Double-Unit Model | 115V 60Hz |
| **1844074** | Double-Unit Model | 220-240V 50Hz |
| **1844075** | Double-Unit Model | 220-240V 60Hz |

**Ordering Information -** Manually-Operated Grease Workers

| Catalog Number | Product Description |
|---|---|
| **1865155** | Grease Working Machine |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2038171** | Dial Thermometer - Inserts in petcock of steel grease worker. Supplied with adapter. |
| **1174514** | Overflow Ring - Collects displaced grease during penetration measurements. |
| **2035220** | Steel Grease Worker - Complete per ASTM specifications. Consists of cup, cover, plunger, and vent cock. |
| **2036303** | Steel Grease Worker - Similar to 2035220 above, but with 270-hole plunger plate per FTM 791-313 (An-G-15) specifications. |
| **2035643** | Cover Assembly - Replacement cover assembly for steel grease worker. Includes vent cock, plunger plate, shaft, and handle. |
| **2037672** | Grease Cup |
| **2037446** | Blank Lid, with seal - For ASTM Steel Grease Worker. Use when heating samples prior to test. |

# FLASH POINT TESTING EQUIPMENT


• Automatic Abel Flash Point Tester....33
• Automatic Pensky-Martens Closed Cup Flash Point Tester....33
• Pensky-Martens Closed Cup Flash Tester....34
• Automatic Tag Closed Cup Flash Point Tester....35
• Tag Closed Cup Flash Tester....36
• Tag Open-Cup Flash Tester....37
• Automatic Cleveland Open Cup Flash Point Tester....38
• Cleveland Open-Cup Flash Tester....39
• Rapid Closed-Cup Flash Tester....40
• Autoignition Apparatus....41

## Automatic Abel Flash Point Tester

### Features and Benefits

- Conforms to IP 170 and related specifications
- Simple automation routine for easy operation

### Automatic Abel Flash Point Tester

The automated Abel flash point tester is used primarily to test flammable and combustible materials for shipping and safety regulations. The flash tester provides an increased temperature range of operation as compared with other testers, allowing greater flexibility in testing samples according to the Abel test method. The unit provides a test range to 110°C and can be extended to -30°C by any appropriate external chiller. The flash point tests are simply conducted by mounting the flash cup filled with sample into the test position and selecting a pre- or user-programmed test method. Automation routines provide accurate test results. A quick search method is available to determine the flash point of unknown samples. The dual detection system (thermal and ionization) allows for testing of all types of products. Ignition by gas flame or electrical igniter are included on both models, along with safety cut-off devices. The test results are automatically corrected to standard pressure (101.3 kPa). The system is equipped with a differential Pt-100 RTD probe designed to duplicate the response time of a mercury-in-glass thermometer and with multiple sensors that continually monitor instrument function, displaying an error message if a problem is detected.

**Specifications**

Conforms to the specifications of:
IP 170; ISO 1523, 13736; NF M 07-011; NF T 06-009

**Electrical Requirements**

115/230V 50/60Hz, Single Phase

**Dimensions** lxwxh,in.(cm)

10.25 x21x19.75 (26x5.53x50)

Net Weight:
44 lbs (20kg)

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2298861** | Automatic Abel Flash Point Tester | 1150V 60Hz |
| **2042844** | Automatic Abel Flash Point Tester | 230V 50Hz |

Temperature range of flash tester can be extended. external chiller must be ordered separately.

## Automatic Pensky-Martens Closed Cup Flash Point Tester

### Test Method

For flash point determinations of fuels, lubricating oils, liquids containing suspended solids and liquids that tend to form a surface film during testing.

### Features and Benefits

- Conforms to ASTM D93 and related specifications
- Simple automation routine for easy operation
- Dual flash point detection system (thermal and ionization) for measurement of samples containing water and/or silicone
- Gas or electric ignition
- Flash point operation range between 0 and 400°C
- Large viewing screen for observing test status at a distance from the unit
- Automatic barometric correction

### Automatic Pensky-Martens Closed Cup Flash Point Tester

The automated Pensky-Martens flash point tester accurately determines the lowest flash point temperature of fuels, lubricating oils, and



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homogeneous liquids (ASTM D93 A), or liquids containing suspended solids as well as liquids that tend to form a surface film during testing (ASTM D93 B). Flash point tests are simply conducted by mounting the flash cup filled with sample into the test position and selecting a pre- or user-programmed test method. A quick search method allows for determination of flash points for unknown samples and a method for asphalts is also included. The automation routines provide accurate test results, even with users inexperienced in flash point test methods. The flash point test result is automatically corrected to standard pressure (101.3 kPa). The unit is equipped with a differential Pt-100 RTD probe designed to duplicate the response time of a mercury-in-glass thermometer as per ASTM D93-02a and E1-03a. The system features multiple sensors for continually monitoring of instrument function and displaying an error message if a problem is detected. The performance of the electrical igniter is continuously checked, and the user is notified upon the need of replacement due to either damage or the end of its useful life. The system is easily interfaced with an external PC for operation and method updates. When performing a test, the system will display the stirring speed, temperature curve (also printed out), and current test status. The system alerts the user is also alerted if the first application of the ignitor results in a flash or if no flash point is detected at the end of the test program. If a flash is not detected 30°C above the expected flash point or at 400°C, then the test is automatically aborted for safety. An easy connection to the air ventilation system or external water connection provides a quick cool down between test runs for operational efficiency.

**Specifications**

Conforms to the specifications of:
ASTM D93; IP 34; ISO 2719; DIN EN 22719; NF M 07-019; JIS K2265

**Electrical Requirements**

115/230V 50/60Hz, Single Phase

**Dimensions** lxwxh,in.(cm)
10.24x21.06x19.69 (26x53.5x50)
Net Weight:
44 lbs (20kg)

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2023232** | Automatic Pensky-Martens Closed Cup Flash Point Tester | 115V 60Hz |
| **2038954** | Automatic Pensky-Martens Closed Cup Flash Point Tester | 230V 50Hz |

## Pensky-Martens Closed Cup Flash Tester

### Test Method

For flash point determinations of fuels, lubricating oils, liquids containing suspended solids and liquids that tend to form a surface film during testing.

### Features and Benefits

- Conforms to ASTM D93 and related specifications
- Choice of electric or gas heating

### Pensky-Martens Closed Cup Flash Tester

Determines flash points of a wide range of products by a closed cup method with two option speed stirring of the sample. Extensively used in shipping and safety regulations for detection of contamination by volatile and flammable materials in fuel oils and lubricating oils, and for characterization of hazardous waste samples.

Smooth operating cover mechanism slides shutter open and applies test flame at the turn of a knob. Cover fits over brass test cup and includes pilot flame, test flame reference bead, built-in stirrer and plated brass thermometer ferrule.

Electrically heated model is equipped with a 750W nickel-chromium heater with stepless variable control for accurate, repeatable temperature rate of rise settings per specifications. Heater unit is enclosed in a stainless steel housing with cooling vents. Includes line cord receptacle and switch for accessory slow speed stirrer.

Gas heated model has a built-in nickel plated brass natural gas burner, or can be supplied with an artificial gas burner or liquid propane burner (specify when ordering). Both models are mounted on a sturdy cast iron base.

**Specifications**

Conforms to: ASTM D93; AASHTO T73-811; IP 34; ISO 2719; DIN 51758; FTM 791-1102; NF M 07-019

**Electrical Requirements**

115V 50/60Hz, Single Phase, 6.5A

220-240V 50-60Hz, Single Phase, 3.4A

**Included Accessories**

Brass Test Cup with Handle

Thermometer Holder

**Dimensions** lxwxh,in.(cm)

9.5x8x22.5 (24x20x57) with optional stirrer motor installed

Net Weight:

1844063: 21 lbs (9.5kg)

1186675/K16270: 24 lbs (10.9kg)

**Shipping Information**

Shipping Weight: 30 lbs (13.6kg)

Dimensions: 3.1 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **1186675** | Electrically Heated Model | 1150V 60Hz |
| **1455928** | Electrically Heated Model | 230V 50Hz |
| **1844063** | Gas Heated Model | |

**Accessories**

| Catalog Number | Product Description | Electrical Requirements | Temperature Range |
|---|---|---|---|
| **1186676** | Stirrer Motor - Slow speed gear motor rotates stirrer of Pensky-Martens Tester at 115rpm for Procedure A and at 250rpm for Procedure B. Includes adjustable support bracket and mounting rod. Installs in base of flash tester. | 115V 50/60Hz | |
| **1340207** | Stirrer Motor. | 220-240V 50Hz | |
| **1793619** | ASTM 9F Thermometer. | | 20 to 230°F |
| **2036580** | ASTM 9C Thermometer. | | -5 to +110°C |
| **1793620** | ASTM 10F Thermometer. | | 200 to 700°F |
| **2019651** | ASTM 10C Thermometer. | | 90 to 370°C |
| **1186673** | Cover Assembly - Complete assembly. Includes shutter, flame exposure device, stirrer and thermometer ferrule. | | |
| **1186674** | Brass Test Cup - With heat resistant handle. | | |

## Automatic Tag Closed Cup Flash Point Tester

### Test Method

For flash point determinations of liquids with a viscosity of below 5.5 centistokes (cSt) at 104°F (40°C) or below 9.5cSt at 77°F (25°C), and a flash point below 200°F (93°C) except cut-back asphalts, those liquids which tend to form a surface film under test conditions and materials which contain suspended solids

### Features and Benefits

- Conforms to ASTM D56 and related specifications
- Simple automation routine for easy operation

### Automatic Tag Closed Cup Flash Point Tester

The automated Tag Closed Cup flash point tester ensures the accuracy and precision required according to the ASTM D56 and related test methods. The test sample is heated at a prescribed rate of temperature increase throughout the standard temperature test range to 100°C. The flash point tests are simply conducted by mounting the flash cup filled with sample into the test position and selecting a pre-programmed test method

or the search mode to determine an approximate flash point. The automation routines provide accurate test results. Ignition by gas flame or electrical ignitor is included, along with safety cut-off devices. The measurement range can be extended to –30°C by any appropriate external chiller. Supervision software is included.

**Specifications**
Conforms to the specifications of:
ASTM D56; IP 304

**Electrical Requirements**
115/230V 60/50Hz, Single Phase

**Dimensions** lxwxh,in.(cm)
21 x10.5x19.75 (53.5x26x50)
Net Weight:
44 lbs (20kg)

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2048380** | Automatic Tag Closed Cup Flash Point Tester | 115V 60Hz |
| **2281812** | Automatic Tag Closed Cup Flash Point Tester | 230V 50Hz |

## Tag Closed Cup Flash Tester

### Test Method

For flash point determinations of liquids with a viscosity of below 5.5 centistokes (cSt) at 104°F (40°C) or below 9.5cSt at 77°F (25°C), and a flash point below 200°F (93°C) except cut-back asphalts, those liquids which tend to form a surface film under test conditions and materials which contain suspended solids.

### Features and Benefits

- Conforms to ASTM D56 and related specifications
- Gas or electrical heating

### Tag Closed Cup Flash Tester

Determines flash points of liquid products by the Tag Closed Cup method. Features stepless variable heat control with reference dial for accurate repeat setting of temperature rate of rise per specifications. Also available with gas burner instead of electric heater. Precision machined cover mechanism simultaneously opens slide shutter and applies test flame to sample at the turn of a knob. Includes liquid bath with constant level overflow, brass test cup, plated brass thermometer ferrules and test flame reference bead. Bath and cover mechanism are constructed of plated brass. Heater is enclosed in a cast aluminum base assembly.

**Specifications**
Conforms to: ASTM D56; IP 304; FTM 791-1101

**Electrical Requirements**
115V 50/60Hz, Single Phase, 1.3A
220-240V 50/60Hz, Single Phase, 0.6A

**Included Accessories**
Brass Test Cup
Cover Assembly (includes Slide Shutter, Burner and Thermometer Ferrules)

**Dimensions lxwxh,*in.(cm)**
5x5x16 (13x13x41)
*with thermometers inserted
Net Weight: 7 lbs (3.2kg)

**Shipping Information**
Shipping Weight: 8 lbs (3.6kg)
Dimensions: 0.76 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **1186787** | Electrically Heated Model | 115V 50/60Hz |
| **1844058** | Electrically Heated Model | 220-240V 50/60Hz |
| **2036491** | Gas Heated Model | |

**Accessories**

| Catalog Number | Product Description | Temperature Range |
|---|---|---|
| **1793619** | ASTM 9F Thermometer | 20 to 230°F |
| **2036580** | ASTM 9C Thermometer | -5 to +110°C |
| **1795193** | ASTM 57F Thermometer | -4 to +122°F |
| **1795194** | ASTM 57C Thermometer | -20 to +50°C |
| **1342452** | Cover Assembly Includes slide shutter burner and thermometer ferrules | |
| **1844057** | Brass Test Cup | |

## Tag Open-Cup Flash Tester

### Test Method
For determination of flash and fire points of liquids at temperatures of up to 325°F (163°C) and flash points of cutback asphalts at temperatures of less than 200°F (93°C).

### Features and Benefits
- Conforms to ASTM D1310, D3143 specifications
- Choice of gas or electrically heated

### Tag Open-Cup Flash Tester
Determines Tag Open-Cup flash point of liquid products and cutback asphalts. Includes sample test cup, plated brass liquid bath with constant level overflow, pivoting ignition taper with pilot light and reference bead, pivoting thermometer holder, heater and cast aluminum base.
Electrically heated model is equipped with stepless variable heat control for accurate control of temperature rate of rise per specifications. Also available with gas or burner

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**Specifications**
Conforms to: ASTM D1310, D3143

**Electrical Requirements**
115V 50/60Hz, Single Phase, 13A
220-240V 50/60Hz, Single Phase, 0.6A

**Included Accessories**
Pyrex™ Sample Cup

**Dimensions** lxwxh,*in.(cm)
10x7x17 (25x18x43)
*with thermometer inserted
Net Weight: 7.5 lbs (3.4kg)

**Shipping Information**
Shipping Weight: 9.5 lbs (4.3kg)
Dimensions: 1.3 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **1186672** | Electrically Heated Model | 115V 50/60Hz |
| **1844061** | Electrically Heated Model | 220-240V 50/60Hz |
| **1844062** | Gas Heated Model | |

**Accessories**

| Catalog Number | Product Description | Temperature Range |
|---|---|---|
| **1797869** | ASTM 33F Thermometer | -36.5 to +107.5°F |
| **1797870** | ASTM 33C Thermometer | -38 to +42°C |
| **1793619** | ASTM 9F Thermometer | 20 to 230°F |
| **2036580** | ASTM 9C Thermometer | -5 to +110°C |
| **1797874** | ASTM 35F Thermometer | 194 to 338°F |
| **1797873** | ASTM 35C Thermometer | 90 to 170°C |
| **1340206** | Leveling Device - For proper adjustment of sample level in test cup. Meets ASTM specifications. Polished aluminum | |
| **1844060** | Draft Shield | |
| **1844059** | Sample Cup | |

## Automatic Cleveland Open Cup Flash Point Tester

### Test Method

- Flash point operation between ambient and 400°C
- Gas or electric ignition

### Features and Benefits

- Conforms to ASTM D92 and related specifications
- Simple automation routine for easy operation
- For flash points above 79°C (175°F)

Automatic Cleveland Open Cup Flash Point Tester
The automated Cleveland Open Cup flash point tester accurately determines flash and fire point temperatures of viscous petroleum products including oils and bitumens over an extended temperature range. When examining highly viscous specimens, a preheating time and temperature are set in order to liquefy the sample for testing. The surface skin from bituminous samples can be removed with a skimmer. The flash/fire point tests are simply conducted by mounting the flash cup filled with sample into the test position and selecting a pre-programmed test method or the search mode to determine an approximate flash point. The test results are automatically corrected to standard pressure (101.3 kPa). Equipped with a differential Pt-100 RTD probe, the system is designed to duplicate the response time of a mercury-in-glass thermometer. Multiple sensors continually monitor instrument function, displaying an error message if a problem is detected. The performance of the ionization sensor which

detects the flash and fire points is continuously monitored, and the user is notified upon the need of replacement. If a flash is not detected 20°C above the expected flash point or at 420°C, then the test is automatically aborted for safety. The system is easily interfaced with an external PC for operation and method updates. When performing a test, the system will display the stirring speed, temperature curve (also printed out), and current test status. The system alerts the user if the first application of the ignitor results in a flash or if no flash point is detected at the end of the test program. If a flash is not detected 30°C above the expected flash point or at 400°C, then the test is automatically aborted for safety.

**Specifications**

Conforms to the specifications of:
ASTM D92; IP 36; ISO 2592

**Electrical Requirements**

115/230V 60/50Hz 1000W, Single Phase

**Dimensions** lxwxh,in.(cm)
21x10.5x19.75 (53.5x26x50)
Net Weight:
44 lbs (20kg)

**Ordering Information**

| Catalog Number | | Order Qty |
|---|---|---|
| | **Automatic Cleveland Open Cup Flash Point Tester** | 1 |
| **2277510** | Automatic Cleveland Open Cup Flash Point Tester, 115V 60Hz | |
| **2275356** | Automatic Cleveland Open Cup Flash Point Tester, 230V Hz | |

## Cleveland Open-Cup Flash Tester

### Test Method

For flash and fire points of all petroleum products, except fuel oils and those having an open cup flash below 79°C (175°F).

### Features and Benefits

- Conforms to ASTM D92 and related specifications
- For flash points above 79°C (175°F)

### Cleveland Open-Cup Flash Tester

Determines flash and fire points by the Cleveland Open-Cup method. Consists of test flame applicator, brass test cup, thermometer support, heating plate and electric heater. Applicator is precisely aligned per specifications and pivots for test flame application at specified temperature intervals. Hinged thermometer support raises to facilitate placement and removal of test cup. Adjust flame size using built-in needle valve and comparison bead.

Equipped with a 1000W nickel-chromium heater with stepless variable heat control for accurate repeat setting of temperature rate of rise per specifications.

Heater unit is enclosed in a stainless steel housing with cooling vents. Test flame applicator and thermometer support are constructed of machined nickel plated brass.

**Specifications**

Conforms to: ASTM D92, D6074, D6158; AASHTO T48; ANS Z-11.6; IP 36; ISO 2592; DIN 51376; FTM 791-1103, FTM 141-4294

**Electrical Requirements**

115V 50/60Hz, Single Phase, 6.5A
220-240V 50/60Hz, Single Phase, 3.4A

**Included Accessories**

Brass Test Cup

**Dimensions** lxwxh,in.(cm)
10x5.5x14 (25x14x36)
Net Weight: 8.5 lbs (3.9kg)

**Shipping Information**

Shipping Weight: 12 lbs (5.4kg)
Dimensions: 1.5 Cu. ft.



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| Ordering Information | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Electrical Requirements** |
| **1186784** | Electrically Heated Model | 115V 50/60Hz |
| **1186784** | Electrically Heated Model | 220-240V 50/60Hz |

| Accessories | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Temperature Range** |
| **2037667** | ASTM 11F Thermometer | 20 to 760°F |
| **1795618** | ASTM 11C Thermometer | -6 to +400°C |
| **1186785** | Cleveland Open Flash Cup Precision machined brass with heat resistant handle | |

## Rapid Flash Closed-Cup Tester

### Test Method

Verifies the flash point or the sustained burning qualities of small samples in the range of –30°C to +300°C.

### Features and Benefits

- Conforms to ASTM D3278, D3828, D4206; DOT CFR 49-173.115; IATA;ISO 9038 and related specifications
- One minute test with a 2mL sample
- Simple to operate

### Rapid Flash Tester

Rapid Tester® provides rapid determinations of flash point or sustained burning qualities by using a small sample. A flash/no flash test result is achieved in one minute for flash points below 212°F (100°C) with a 2mL sample. Ideally suited for quality assurance and environmental compliance testing as well as actual flash point for paints, fragrances, hydrocarbons and other liquids. Open cup models are used for determining sustained burning qualities characteristics of mixtures of flammable and nonflammable liquids or liquids with widely different flash points when assessing flammability characteristics. Features convenient semi-automatic operation for flash/no flash tests. Set the test temperature on the digital display and inject a 2mL or 4mL sample into the sample cup. The tester quickly stabilizes itself at the desired value, permitting the test flame to be applied and the result to be observed by the operator. Unit also performs conventional determinations of actual flash temperature by the small scale closed tester method.

Two models are offered: the Closed Cup Model is for routine flash point tests in the range from –30 to +300°C (–22 to +572°F); the Open-Cup Model is for sustained burning tests in the range from ambient to 212°F (100°C). Both models include automatic temperature control with °C/°F selector switch, syringe, electronic timer, integral NIST traceable thermometer, and an external hose adapter valve for connection to a customer-supplied fuel cylinder or other fuel source.

**Specifications**

Conforms to the specifications of:
ASTM D3278, D3828, D4206; IP 303; ISO 3679, ISO 3680, ISO 9038; DOT CFR 49-173.115; IATA

**Included Accessories**

Thermometer, range 32 to 572°F (0 to 300°C) Syringe

**Dimensions** lxwxh,in.(cm)
15x23.4x6.3 (38.1x8.6x16.2)
Net Weight: 10 lbs (4.6kg)

**Shipping Information**

Shipping Weight: 16 lbs (7.26kg)
Dimensions: 2.3 Cu. ft.

| Ordering Information | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Electrical Requirements** |
| **1402104** | Rapid Flash Tester, Closed Cup - Aluminum Test Cup/Brass Lid & Shutter | 115V |
| **2035665** | Rapid Flash Tester, Closed Cup - Aluminum Test Cup/Brass Lid & Shutter | 220-240V |
| **1844064** | Rapid Flash Tester, Closed Cup - Stainless Steel Test Cup/Lid & Shutter | 115V |
| **1844067** | Rapid Flash Tester, Closed Cup - Stainless Steel Test Cup/Lid & Shutter | 220-240V |
| **1844065** | Rapid Flash Tester, Open-Cup - Aluminum Test Cup | 115V |
| **1844068** | Rapid Flash Tester, Open-Cup - Aluminum Test Cup | 220-240V |
| **1844066** | Rapid Flash Tester, Open-Cup - Stainless Steel Test Cup | 115V |
| **1844069** | Rapid Flash Tester, Open-Cup - Stainless Steel Test Cup | 220-240V |

| Accessories | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Temperature Range** |
| **2036754** | Fuel Cylinder Valve | |
| **2035607** | Heat Transfer Compound for thermometer | |
| **2036274** | Metal Cooling Block to facilitate cooling of the sample cup between tests | |
| **2036683** | Refrigerant Charged Cooling block to hold cooling mixture for sub ambient testing | |
| **2035377** | Syringe 2mL/4mL | |
| **2036556** | Thermometer | 32 to 572°F/0 to 300°C |
| **2035352** | Thermometer | 32 to 230°F |
| **2038249** | Thermometer | 212 to 572°F |
| **2038129** | Thermometer | 0 to 110°C |
| **2037998** | Thermometer | 100 to 300°C |
| **2035047** | Thermometer | -36 to +105°F |
| **2036287** | Thermometer | -38 to +40°C |

## Autoignition Apparatus

### Test Method

Determines the lowest temperature at which the vapors of a liquid or solid chemical sample will self-ignite under prescribed laboratory conditions. The temperatures at which 'cool flame' and 'hot flame' ignitions occur, as evidenced by sudden temperature increases in the sample flask, are measured and recorded, and the delay time between introduction of the sample and ignition is timed.

### Features and Benefits

- Conforms to ASTM E659 specifications
- Digital furnace temperature control
- Digital flask temperature display

### Autoignition Apparatus

Modified crucible furnace with digital thermocouple readout of flask temperature at prescribed points per ASTM specifications. Linearized analog output permits connection to a strip chart recorder or datalogging instrument. Furnace provides rapid response and ±1°C stability throughout the operating range of 200 to 1200°C. Cylindrical heating chamber provides excellent radial temperature uniformity. Furnace cover has ports for flask exterior thermocouples, and a borosilicate glass thermocouple tube is provided to assure correct positioning of the gas temperature thermocouple inside the test flask. Thermocouples plug directly into the furnace control unit for quick disconnection when removing the flask. A hinged holder in the cover facilitates handling of the test flask. Adjustable mirror permits safe viewing of the flask interior during testing. Control panel has temperature controls and digital thermocouple readout with four-position selector switch.

**Specifications**

Conforms to: ASTM E659
Temperature Range: 200 to 1200°C
Temperature Control: digital setpoint solid state controller accurate to within ±1°C
Flask Temperature Display: 0-1200°C, with four position selector switch
Electrical Requirements
220-240V 50/60Hz, Single Phase, 7.7A

**Included Accessories**

Test Flask, 500mL
Thermocouples (4)

**Dimensions** lxwxh,in.(cm)

Furnace: 15x15x22 (38x38x56)
Control Cabinet: 22x10x14 (56x25x36)
Net Weight: 72 lbs (32.8kg)

**Shipping Information**

Shipping Weight: 98 lbs (44.5kg)
Dimensions: 16.3 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2038039** | Autoignition Apparatus | 220-240V, 50/60Hz |

**Accessories**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2037101** | Syringe, 1mL | |
| **2035918** | Needle, 6", stainless steel | |
| **2035779** | Recorder - Records signal from the internal gas thermocouple in strip chart form. | 115V 50/60Hz |
| **2037734** | Recorder | 220-240V 50/60Hz |
| **2037298** | Hot Air Gun - For purging product gases between tests | 115V 50/60Hz |
| **2037501** | Hot Air Gun | -6 to +400°C |
| **2036651** | Test Flask, 500mL | |

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# Color Measurement

## Portable Automated Colorimeter

### Portable Automated Colorimeter

- Measures the 4 most important color scales used for liquid chemicals, resins, oils, fuels, and fats for liquid color measurement
- Touch Screen TFT-Display
- Compact housing suitable for both field and laboratory use
- Modern user interface with sample and user ID entry in 16 languages
- Automatic cuvette recognition
- Data memory for up to 200 measurements
- Automatic Zero Calibration Program
- Reference Beam Technology
- Password Protection, GLP documentation
- USB-A port for printer, keyboard or memory stick
- USB-B port for PC connection

High performance, microprocessor controlled photometer combines easy operation with highly accurate results. Featuring a complete set of quality control action items that includes a menu-driven handling procedure for the automatic pass/fail specification check based on a certified test filter, a reminder function for re-calibration and an inspection time interval reminder. Capable of performing exact colorimetric evaluations in conformity with several ISO, DIN and ASTM standards with just a single measurement.

Automatic calibration memory, special cuvette recognition logic and the spectral measurement method yield precise and reliable color measurements necessary for high intra and inter instrument reproducibility. An optional Battery power pack allows for use in the field for days without a mains connection.

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2258130** | Starter Kit - Consists of Addista Color Standards; 50 x 10 Rectangular Cuvettes, Pk/10; Cuvette Set, 10 x 11mm round glass cuvettes |
| **2352449** | Test filter set for stray light, absorbance and wavelength check |
| **2048575** | Certified Testing solution set “Addista-Color” |
| **2048571** | Round Cuvettes 11mm, glass, disposable, pk/500 |
| **2048572** | Rectangular Cuvette 50 x 10 mm, plastic, disposable, pk/50 |
| **2352450** | Rectangular Cuvette 50 x 10 mm with caps, plastic, disposable, pk/10 |
| **2288257** | Rectangular cuvette 50 x 10 mm, glass, pk/1 |
| **2352451** | Rectangular cuvette 10 x 10 mm, glass, pk/3 |
| **2283717** | USB-Keyboard (keyboard layout:US) |
| **2283716** | USB-Barcode Scanner (hand-held scanner) |
| **2352452** | USB-Memory Stick |
| **2352454** | Lithium-Ion Battery, 11V, 4400mAh, 300g |
| **2346809** | Replacement Tungsten bulb 6V, 10W |
| **2346811** | PC-Software Datatrans, incl. USB cable |

*Please use the 2288257 Rectangular cuvette 50 x 10, glass, pk/1 or 2352451 Rectangular cuvette 10 x 10, glass, pk/3 when testing hydrocarbons for color measurements. The disposable polycarbonate cuvettes are made for aqueous samples.*

**Color measurement methods**
- Hazen Color, APHA Color, Pt/Co Color (ASTM D1209, ISO 6271)
- Gardner Color (ASTM D1544, ISO 4630)
- Iodine Color (DIN 6162)
- Say bolt Color (ASTM D156, NF M 07-003)

**Specifications**

Conforms to the specifications of:
ASTM D156, D1209, D1544, D6166; 4630, 6271; DIN 6162;
NF M 07-003
Wavelength Range: 400 to 700nm / 20nm
Photometric accuracy: 5 mAbs at 0.0 to 0.5 Abs 1% at 0.50 to 2.0 Abs
Photometric linearity: <0.5% to 2 Abs
≤ 1% at > 2 Abs with neutral glass at 546 nm
Stray light: > 3.0 Abs. at 500nm with OG570/3
Light Source: Gas-filled Tungsten bulb (visible spec)

**Included Accessories**

Universal power supply 100-240V, 50-60Hz, with exchangeable plug adapters for EU, GB, US, China
Dust Cover
User Manual

**Dimensions** lxwxh,in.(cm)
12.9x8.6x5.3 (33x22x13.5)
Net Weight: 8.95 lbs (4.06kg)

**Shipping Information**

Shipping Weight: 13 lbs (5.9kg)
Dimensions: 18x15x11in. (45.7x38.1x27.9cm)

**Electrical Requirements**

100-240V 50-60Hz

**Ordering Information**

| Catalog Number | Product Description |
|---|---|
| **2288256** | Portable Automatic Colorimeter |

## Automated Colorimeter

### Automated Colorimeter

- Touch-screen TFT-Color Display
- Automatic cuvette recognition
- Data log for 500 color values, 50 color reference values, 500 photometric readings, 20 wavelength scans, 20 time scans
- Automatic zero calibration program
- Reference Beam Technology
- Password protection, GLP documentation
- USB-Ports: 1 x Type A and 1 x Type B

High performance, microprocessor controlled spectrophotometer with a wavelength range from 380 to 720 nm for color measurement or 320 nm up to 1100 nm for routine analysis. The 2258129 can carry out an exact colorimetric evaluation in conformity with several ISO/ASTM standards with just a single measurement and display the result in terms of traditional color systems such as Iodine, Hazen/APHA or Gardner color numbers as well as in modern CIE-L*a*b* color values. Besides the over 20 color indexes, transmittance and absorbance can be measured at individual wavelengths, so that the 2258129 can be used universally for analytical purposes in the laboratory

**Photometer methods**
- Wavelength Scan 320-1100nm incl. Difference Mode
- Time Course Mode
- Single and Multi Wavelength Mode

**Color measurement methods**
- Iodine, Hazen, APHA, Pt/Co, Gardner-Color
- Say bolt, Klett-color
- Hess-Ives, ADMI, Yellowness-index
- AOCS-Red/Yellow, Chlorophyll A
- CIE-Lab, Hunter-Lab, XYZ, Tristimulus Values
- European and US Pharmacopoeia

**Specifications**

Conforms to the specifications of:
ASTM D156, D1209, D1544, D1925, D6045, D6166; ISO 2049, 4630, 6271; DIN 5033, 6162, 6174; AOCS Cc 13e; USP Ch 631, 1061; Ph EUR; NF M 07-003; NF T 60-104
Spectral Bandwidth: 5 nm
Wavelength Reproducibility: 0.1nm
Wavelength Resolution: 1nm
Scanning Speed: 12 nm/s (in steps of 1 nm)
Stray Light: < 0.1% T at 340 nm with NaNO2
Color Measurement: 380-720nm in steps of 10nm
Wavelength Range: 320-1100nm in steps of 1nm
Wavelength Accuracy: +/- 1.5 nm (wavelength range 340-900 nm)
Photometric Measuring Range: +/- 3.5 Abs
(wavelength range 340-900 nm)
Photometric Accuracy: 5 m Abs at 0.0 to 0.5 Abs
1% at 0.50 to 2.0 Abs
Photometric linearity: < 0.5% to 2 Abs
1% at > 2 Abs with neutral glass at 546 nm
Light Source: Gas-filled Tungsten (visible)

**Included Accessories**

- Universal power supply 100-240V, 50-60 Hz, with exchangeable plug adapters for EU, GB, US, China
- Dust Cover
- User Manual

**Dimensions** lxwxh,in.(cm)
14.5 x 14.1 x 5.7 (36.8 x 35.9 x 14.4)
Net Weight: 14.11 lbs (6.4 kg)

**Shipping Information**

Shipping Weight: 18 lbs (8.2 kg)
Dimensions:20x16x16in.

**Electrical Requirements**

115-240V, 50/60 Hz

**Ordering Information**

| Catalog Number | Product Description |
|---|---|
| **2258129** | Automatic Colorimeter 115-240V, 50/60 Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2258130** | Starter Kit - Consists of Addista Color Standards; 50 x 10 Rectangular Cuvettes, Pk/10; Cuvette Set, 10 x 11mm round glass cuvettes |
| **2283716** | USB-Barcode Scanner (hand-held scanner) |
| **2258138** | Test filter set for stray light, absorbance and wavelength check |
| **2283717** | USB-Keyboard (keyboard layout: US |
| **2048575** | Certified Testing solution set “Addista-Color” |
| **2048571** | Round cuvettes 11mm, glass, disposable, pk/500 |
| **2048572** | Rectangular cuvette 50 x 10mm, plastic, disposable, pk/50 |
| **2352450** | Rectangular cuvette 50 x 10mm with caps, plastic, disposable, pk/10 |
| **2288257** | Rectangular cuvette 50 x 10, glass, pk/1 |
| **2352451** | Rectangular cuvette 10 x 10, glass, pk/3 |
| **2346808** | Printer for 2258129 |
| **2048576** | Rack for 7 50x10 cuvettes |

*Please use the 2288257 Rectangular cuvette 50 x 10, glass, pk/1 or 2352451 Rectangular cuvette 10 x 10, glass, pk/3 when testing hydro carbons for color measurements. The disposable polycarbonate cuvettes are made for aqueous samples.*

# Saybolt and Saybolt Wax Chromometers

## Test Method

The Saybolt Color test is used for quality control and product identification purposes on refined products having an ASTM Color of 0.5 or less. Products in this range include undyed motor and aviation gasolines, jet propulsion fuels, naphthas, kerosene and petroleum waxes. Color is an important quality characteristic for many products, and can also be used to detect product contamination. The Saybolt Chromometer measures color by comparing a column of sample against standard color discs. The Saybolt Wax Chromometer measures color of non-fluid waxes by heating the samples during the test.

## Features and Benefits

- Conforms to ASTM D156 and related specifications
- Three-position color standard turret
- Tests non-fluid waxes and liquid petroleum products

## Saybolt and Saybolt Wax Chromometers

Determines Saybolt Color of highly refined petroleum products. Consists of a matched set of sample and standard tube assemblies with optical viewer. Compares a sample of the product to be tested against standard color discs under a uniform light source. Reduce column height until the sample field is lighter than the color standard and convert height to Saybolt Color using chart on instrument. Three-position turret on standard tube permits convenient changing of color disc combinations. Accessory Daylight Lamp (Cat. No. 1186780) provides standard light source per ASTM specifications.

For petroleum waxes, the Saybolt Wax Chromometer is equipped with heaters to keep waxes that are not fluid at ambient temperature molten during testing. Sample tube has a 200W chrome steel strip heater and a hinged cover to maintain even heat distribution. An aluminum block heater with 50W cartridge element keeps wax molten in the drain cock assembly. Accessory variable transformer may be used to regulate the sample temperature. Optical viewer and stand are fully insulated from the heaters. Sample tube assembly has heat resistant fiber handles.

**Specifications**

Conforms to the specifications of:

ASTM D156; DIN 51411; FTM 791-101; NF M 07-003

**Included Accessories**

Whole Color Standards (3)

Half Color Standard (1)

Engraved Conversion Chart

**Dimensions** lxwxh,in.(cm)

5.5x5.5x26.5 (14x14x67)

Net Weight: 15.5 lbs (7kg)

**Shipping Information**

Shipping Weight: 31 lbs (14.1kg)

Dimensions: 4.0 Cu. ft.

Includes accessory lamp



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| Ordering Information | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Electrical Requirements** |
| **1865100** | Saybolt Chromometer | |
| **1865101** | Saybolt Wax Chromometer | 115V 50/60Hz |
| **1844055** | Saybolt Wax Chromometer | 220-240V 50/60Hz |

| Accessories | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Electrical Requirements** |
| **1186780** | Daylight Lamp - Meets ASTM D156 and related test specifications for illumination of Saybolt Chromometers. Adjustable for correct positioning. Standard 60W bulb not included. | |
| **1791090** | Whole Color Standard | |
| **1791091** | Half Color Standard | |
| **2035098** | Matched Set of Tubes with Turret and Draincock Assembly for 1865100 Saybolt Chromometer | |
| **2038013** | Matched Set of Tubes with Turret and Draincock Assembly for 1865101/1844055 Saybolt Wax Chromometer | |
| **2036586** | Frosted Bulb | 60W, 115V |
| **2023571** | Frosted Bulb | 60W, 220-240V |
| **2036979** | Variable Transformer - Regulates heaters of Saybolt Wax Chromometer. | 115V |
| **2036210** | Variable Transformer | 220-240V |

## ASTM Color of Petroleum Products

### Test Method

The ASTM color of petroleum products applies to products having an ASTM color of 0.5 or darker, including lubricating oils, heating oils, diesel fuel oils and petroleum waxes. (For products having an ASTM color lighter than 0.5, use the Saybolt Chromometer.) To determine ASTM color, the sample is compared against standard color discs in the Petroleum Comparator

### Features and Benefits

- Conforms to ASTM D1500 specifications
- Constructed from ABS (Acrylonitrile Butadiene Styrene) Fire Retardant Plastic. This robust, chemically resistant material is ideal for industrial environments.
- Single press of large switch illuminates sample for one minute (two presses = two minutes, three presses = three minutes). So there is no energy and bulb wastage.
- Halogen, long life, light source combined with standard daylight filters ensures full compliance with previous units and consistency from unit to unit
- Low voltage power supply.
- Disk values are read directly from disks.

- Disk can be simply, but securely, removed allowing replacement if necessary.
- A new replaceable white insert is included with each instrument to ensure correct lighting levels are preserved.
- Fully removable sample chamber allows quick cleanup of inevitable spillages.

## Petroleum Comparator

Single scale, 3-field petroleum comparator designed for visual color grading by direct comparison between the sample and colored glass filters housed in test discs conforming to the chromaticity coordinates of ASTM D1500. The sample and two consecutive glasses on the color scale are viewed simultaneously, making it easier to achieve the optimum color match. For rapid color grading within predetermined color limits, the glass standards can be set to the two limiting colors so that it is easy to check that the sample is within tolerance. The tungsten halogen light source is color corrected to CIE Standard Illuminant C, giving constant lighting conditions for color grading, regardless of ambient lighting. A prism brings the three fields together to aid color grading.

**Specifications**

Conforms to the specifications of:
ASTM D1500, D6074; IP 196; ISO 2049; FTM 791-102

**Included Accessories**

Glass Color Discs (2)
Glass Sample Jars (3)
Calibration Certificate

**Dimensions** dxwxh, in.(cm)

10½ x 9 x 5¼ (26.7x22.9x13.4)
Net Weight: 3.5 lbs (1.6 kg)

**Shipping Information**

Shipping Weight: 15 lbs (6.8kg)
Dimensions: 2.6 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2036676** | Petroleum Comparator | 115V 60Hz |
| **2037563** | Petroleum Comparator | 220-240V 50/60Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2022781** | Sample Container |

## Test Method

Provides an estimate of the color and condition of in-service oils by visual observation and comparison with ASTM color standards in an oil comparator.

## Oil Comparator

Complete ASTM oil color test outfit for comparison of oils against ASTM color standards. Includes two color discs, ranging from 0.5 to 5.0 in 10 steps and 5.0 to 8.0 in 7 steps. Magnifying prism brings the sample and standard color fields together for side by side comparison. Portable unit is suitable for laboratory or field use. Supplied with two precision 33mm rectangular glass cells, carrying case, and instructions

## Features and Benefits

- Conforms to ASTM D1524 specifications
- Yields results equivalent to ASTM D1500

**Shipping Information**

Shipping Weight: 10 lbs (4.5kg)
Dimensions: 1 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2035336** | Daylight Illuminator - Provides uniform lighting for Oil Comparator | 115V |
| **2036294** | Daylight Illuminator | 220-240V |
| **2035136** | Rectangular Glass Cell | |



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| Ordering Information | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2035600** | Oil Comparator |

# Condition Monitoring

## Soot Levels in Diesel Engine Oils, Portable Meter

### Test Method

Measures the amount of suspended carbon (soot) in diesel engine lubricating oils.

### Features and Benefits

- Portable operation
- Measures soot levels as high as 10% and higher

### Soot Levels in Diesel Engine Oils, Portable Meter

The Portable Soot Meter is a hand-held, battery operated diagnostic tool that measures soot concentration levels in diesel engine lubricating oil up to 10% and higher – without sample preparation or solvents. It has been specifically designed for fleet operators, transit authorities, service stations, construction sites, preventative maintenance personnel, or anyone that needs easy, on-site soot measurements to enable them to know exactly when to change the lubricating oil. It is based on the same field-proven infrared technology that is utilized in the 2037678 Soot Meter. Measurement results are shown on digital display in less than one minute. Wipe the sensor clean with absorbent paper towel, and the unit is ready to apply the next used oil sample. The Portable Soot Meter weighs less than 2 lbs. and is powered by four replaceable "AA" batteries providing power for approximately 1000 tests. It is factory calibrated to measure soot levels as high as 10% or higher with an accuracy of within 0.5%.

**Specifications**

Measurement Range: 0 to 10% soot

Measurement Principle: Field Proven Horizontal Attenuated Total Reflectance (HATR) Mid-IR Analysis

Measurement Time: Less Than One Minute Per Analysis

Sampling Procedure: Cover sensor surface with used oil sample from dipstick or sample cup and push "Run" button.

Operating Temperature Range: 40 to 110°F (4 to 45°C)

Output Resolution: 0 -10% soot in 0.5% increments up to 10%. Above 10%, soot in 1% increments.

Non-Volatile Memory: For calibration constants and configuration data

**Electrical Requirements**

Four (4) "AA" Batteries

**Dimensions** lxwxh,in.(cm)

7x4x1.75 (2.75x1.6x0.7)

Net Weight: 2 lbs (0.9kg)

**Shipping Information**

Shipping Weight: 6 lbs (2.7kg)

Dimensions: 1 Cu. ft.

| Ordering Information | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2352484** | Portable Soot Meter |

# Density (Specific Gravity)

## Automatic Density Meter

### Test Method

Density is a fundamental physical property that can be used in conjunction with other properties to characterize the quality of crude oils, light and heavy fractions of petroleum and petroleum products. The test method covers the determination of the density or relative density of crude oils, petroleum distillates and viscous oils that can be handled in a normal fashion as liquids at test temperatures between 15 and 35°C.

**Specifications**

Conforms to the specifications of:
ASTM D1250, D4052, D5002; DIN 51757
Measurement Ranges:
Density: 0 to 3 g/cm3
Temperature: 0°C to 90°C
Pressure: 0 to 10 bars
Measurement Modes: Continuous, Single, Multiple
Accuracy:
2298544: Density: 0.00005 g/cm3
Temperature: 0.03°C
2346793: Density: 0.0001 g/cm3
Temperature: 0.05°C
Repeatability: Density: 0.00001 g/cm3
Temperature: 0.01°C
Minimum Sample Volume: 1 ml, approximately
Wetted Materials: Borosilicate glass, Teflon (PTFE, ECTFE)
Display: 10.4 inch diagonal, 800-600 pixels, color, Flat Panel Monitor with Resistant Touch Screen Interface, 200 bit brightness, gasketted for spill protection.
Communication Interface: Touch Screen User Interface
3 - USB Ports
1 - Cat. 5 Port
2 - RS232 Ports
Keyboard, Bar Code Scanner, Mouse, Network Capabilities
Video and Magnification: Video assisted view of cell, capable of approximately 10X magnification
Internal Memory: 2 GB Non-removable Compact Flash
Electrical Requirements:
85to 260 VAC; 48 to 62 Hz
150- 200 Watts

**Shipping Information**

Shipping Weight: 70 lbs. (31.75 kg)

**Dimensions** lxwxh,in.(cm)

91.44cm (L) x 48.26 cm (W) x 45.72 cm (H)

**Included Accessories**

Quick Start Guide
IQOQPQ Documentation
Desiccant
Luer Syringes
Filling Nozzles
Connecting Fittings & Tubing
NIST Standards
Manual

**Ordering Information**

| Catalog Number | Product Description |
|---|---|
| 2298544 | Automatic Density Meter, Model A |
| 2346793 | Automatic Density Meter, Model B |



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| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2330355** | 21 CFR Part 11 Option |
| **2330356** | Refractometer Control Module |
| **2330373** | Heated Interface Attachment |
| **2330374** | Bar Code Scanner - USB |
| **2330375** | Fluke Hart Thermometer Kit Consists of Handheld Digital Thermometer, Temperature Probe, and Calibration Certificate |
| **2330376** | Inkjet USB Printer Kit Includes Inkjet Printer and USB communication cable |
| **2330377** | Laser USB Printer Kit Includes Laser printer and USB communication cable |
| **2330378** | 40 Column Serial Printer Kit Includes 40 Column Serial (RS232) Printer, Null Modern Cable, and Adapter |

## Constant Temperature Hydrometer Bath, 12 Unit

### Features and Benefits

- Holds 12 hydrometer cylinders
- Can be used for Reid Vapor Pressure immersion type cylinders
- Conforms to ASTM D323, D1298, D6074, D6158 and related specifications

### Constant Temperature Hydrometer Bath

A versatile constant temperature bath designed for density/gravity determinations of petroleum products at temperatures of up to 195°F (90°C), and also for Reid Vapor Pressure determinations using immersion bombs. Microprocessor PID control provides quick temperature stabilization\ without overshoot and the unit is protected by an overtemperature control circuit that interrupts power should bath temperature exceed a programmed cut-off point. Dual LED displays provide actual and setpoint temperature values in °C/°F. Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Contact your EXPOTECHUSA representative for information.

Also available–Special bath to accommodate both ASTM D323 (Vapor Pressure of Petroleum Products–Reid Method) and D942 (Oxidation Stability of Lubricating Greases by the Oxygen Bomb Method), as well as D525 (Oxidation Stability of Gasoline–Induction Method). Please contact a EXPOTECH USA customer service representative for additional information.

**Shipping Information**

Capacity: twelve (12) hydrometer cylinders (without base) or Reid Vapor Pressure one-opening type bombs
Temperature Range: ambient to 250°F (121°C)
Temperature Control Stability: ±0.2°F (±0.17°C)
Heater Range: 0-2500W
Bath Medium: 19 gal (71.9L) water

**Shipping Information**
Capacity: twelve (12) hydrometer cylinders (without base)
or Reid Vapor Pressure one-opening type bombs
Temperature Range: ambient to 250°F (121°C)
Temperature Control Stability: ±0.2°F (±0.17°C)
Heater Range: 0-2500W
Bath Medium: 19 gal (71.9L) water

**Electrical Requirements**
115V 50/60Hz, Single Phase, 22A
230V 50/60Hz, Single Phase, 11A
**Dimensions** lxwxh,in.(cm)
30x14x28 (76x36x71)
Net Weight: 64 Lbs (29.0kg)
**Shipping Information**
Shipping Weight: 118 lbs (53.5kg)
Dimensions: 11.4 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2035475** | Constant Temperature Hydrometer Bath | 115V, 50/60Hz |
| **2036576** | Constant Temperature Hydrometer Bath | 230V, 50/60Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2036633** | Hydrometer Cylinder Borosilicate glass, 15.5"lx2"dia. with 2.5" lip |
| **2037644** | ASTM 61F Thermometer Range: 90 to 260°F |
| **2037170** | ASTM 61C Thermometer Range: 32 to 127°C |

## Constant Temperature Hydrometer Bath, 1 Unit

### Features and Benefits
- Accommodates one standard 2"x15" (51x380mm) hydrometer cylinder with base
- Compact design saves space

### Constant Temperature Hydrometer Bath
Thermostatically controlled water bath with 500W copper immersion heater and hydraulic thermoregulator for operation at temperatures of up to 210 ±2°F (99±1°C). Holds one 2"x15" (51x381mm) hydrometer jar - top of jar extends 1½" (38mm) above the top of the bath for easy viewing of the hydrometer. Insulated double-wall construction with stainless steel tank and shelf and finished steel exterior. Has variable speed control for magnetic stirrer, temperature control dial, and on/off switches for motor and power.

**Specifications**
Temperature Range: Ambient to 210°F (99°C)
Temperature Control Stability: ±2°F (±1°C)
Bath Medium: 2 gal (7.57L) water
Electrical Requirements
115V, 50/ 60Hz, Single Phase, 4.3A
230V, 50/60Hz, Single Phase, 2.2A

**Dimensions** dia.xh (cm)
Bath Interior: 6x16.5 (15x42)
Overall: 9x22 (23x56)
Net Weight: 20 lbs (9.1kg)
**Shipping Information**
Shipping Weight: 35 lbs (15.9kg)
Dimensions: 5 Cu. ft



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| Ordering Information | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Electrical Requirements** |
| **2036834** | Constant Temperature Hydrometer Bath | 115V, 50/60Hz |
| **2037060** | Constant Temperature Hydrometer Bath | 230V, 50/60Hz |

## Hydrometer Cylinders

### Features and Benefits

- Wide base for maximum stability
- Convenient pour-out lip
- Choice of glass or metal construction

| Ordering Information | | | |
|---|---|---|---|
| **Catalog Number** | **Product Description** | **Construction** | **Dimensions dia.xh,in.(cm)** |
| **2037938** | Hydrometer Cylinder | Brass | 2.5x12” (64X305mm) |
| **2035277** | Hydrometer Cylinder | Brass | 2x15” (51x381mm) |
| **2037084** | Hydrometer Cylinder | Glass | 2x15.5” (51x394mm) |

## Density, Relative Density (Specific Gravity), or API Gravity - Hydrometers and Thermohydrometers

### ASTM Hydrometers and Thermohydrometers

For density, relative density (specific gravity) or API gravity determination of crude petroleum, liquid petroleum products and mixtures of petroleum and non-petroleum products.

***Calibrated hydrometers and thermohydrometers are available with an ISO/IEC 17025 and ANSI/NCSL Z-540-1 Report of Calibration.***

**Specifications**

Conforming to the specifications of: ASTM E100

**Applicable Test Method Standards**

ASTM D287, D1298, D6074, D6158; API MPMS Chapter 9.1; IP 160; ISO 3675; DIN 51757

| API Gravity Hydrometers - Standard temperature 60°F, subdivisions 0.1° API, length 330mm | | |
|---|---|---|
| **Catalog Number** | **ASTM Hydrometer No.** | **Nominal API Gravity Range, deg.** |
| **2036672** | 1H | –1 to +11 |
| **2329859** | 2H | 9 to 21 |
| **2035789** | 3H | 19 to 31 |
| **2035121** | 4H | 29 to 41 |
| **2036284** | 5H | 39 to 51 |
| **2037806** | 6H | 49 to 61 |
| **2035525** | 7H | 59 to 71 |
| **2035270** | 8H | 69 to 81 |
| **2035181** | 9H | 79 to 91 |
| **2037626** | 10H | 89 to 101 |

## Specific Gravity Hydrometers

Standard temperature 60/60°F, subdivisions 0.0005, length 330mm

| Catalog Number | ASTM Hydrometer No. | Nominal Specific Gravity Range |
|---|---|---|
| 2036640 | 82H | 0.650 to 0.700 |
| 2036482 | 83H | 0.700 to 0.750 |
| 2037822 | 84H | 0.750 to 0.800 |
| 2035353 | 85H | 0.800 to 0.850 |
| 2037363 | 86H | 0.850 to 0.900 |
| 2035093 | 87H | 0.900 to 0.950 |
| 2035075 | 88H | 0.950 to 1.000 |
| 2037561 | 89H | 1.000 to 1.050 |
| 2037335 | 90H | 1.050 to 1.100 |

## API Gravity Hydrometers

Standard temperature 60°F, subdivisions, 0.1° API, length 330mm

| Catalog Number | ASTM Hydrometer No. | Nominal API Gravity Range, deg. |
|---|---|---|
| 2038205 | 21H | 0 to 6 |
| 2035946 | 22H | 5 to 11 |
| 2037825 | 23H | 10 to 16 |
| 2036086 | 24H | 15 to 21 |
| 2036241 | 25H | 20 to 26 |
| 2036525 | 26H | 25 to 31 |
| 2036836 | 27H | 30 to 36 |
| 2035171 | 28H | 35 to 41 |
| 2035938 | 29H | 40 to 46 |
| 2036540 | 30H | 45 to 51 |
| 2037016 | 31H | 50 to 56 |
| 2036561 | 32H | 55 to 61 |
| 2036231 | 33H | 60 to 66 |
| 2037708 | 34H | 65 to 71 |
| 2035493 | 35H | 70 to 76 |
| 2035194 | 36H | 75 to 81 |
| 2035366 | 37H | 80 to 86 |
| 2037444 | 38H | 85 to 91 |
| 2037499 | 39H | 90 to 96 |
| 2037466 | 40H | 95 to 101 |

## API Gravity Thermohydrometers - Thermometer in Body

Standard temperature 60°F, subdivisions 0.1° API, length 380mm, thermometer scale °F 0-150 (designation L), 30 to 180 (designation M), 60 to 220 (designation H)

| Catalog Number | ASTM Thermohydrometer No. | Nominal API Gravity Range, deg. |
|---|---|---|
| 2036087 | 51HH | –1 to 11 |
| 2035226 | 51HL | –1 to 11 |
| 2036468 | 52HH | 9 to 21 |
| 2035516 | 52HL | 9 to 21 |
| 2036152 | 53HM | 19 to 31 |
| 2038047 | 53HL | 19 to 31 |
| 2035777 | 54HM | 29 to 41 |
| 2037460 | 54HL | 29 to 41 |
| 2035657 | 55HL | 39 to 51 |
| 2036631 | 56HL | 49 to 61 |
| 2036208 | 57HL | 59 to 71 |
| 2036727 | 58HL | 69 to 81 |
| 2037740 | 59HL | 79 to 91 |
| 2035752 | 60HL | 89 to 101 |

## API Gravity Thermohydrometers Thermometer in Stem

Standard temperature 60°F, subdivisions 0.1° API, length 380mm, temperature scale °F 30-220

| Catalog Number | ASTM Thermohydrometer No. | Nominal API Gravity Range, deg. |
|---|---|---|
| 2037979 | 71H | –1 to 11 |
| 2035381 | 72H | 9 to 21 |
| 2037194 | 73H | 19 to 31 |
| 2036211 | 74H | 29 to 41 |

## Specific Gravity Hydrometers

Standard temperature 60/60°F, subdivisions 0.001 length 260mm

| Catalog Number | ASTM Hydrometer No. | Nominal Specific Gravity Range |
|---|---|---|
| 2036770 | 102H | 0.650 to 0.700 |
| 2037462 | 103H | 0.700 to 0.750 |
| 2035677 | 104H | 0.750 to 0.800 |
| 2035935 | 105H | 0.800 to 0.850 |
| 2035671 | 106H | 0.850 to 0.900 |
| 2035506 | 107H | 0.900 to 0.950 |
| 2037473 | 108H | 0.950 to 1.000 |
| 2037465 | 125HL | 1.000 to 1.050 |
| 2037381 | 126HL | 1.050 to 1.100 |
| 2037646 | 127HL | 1.100 to 1.150 |
| 2037219 | 128HL | 1.150 to 1.200 |



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| Catalog Number | ASTM Hydrometer No. | Nominal Specific Gravity Range |
|---|---|---|
| 2037219 | 128HL | 1.150 to 1.200 |
| 2037082 | 129HL | 1.200 to 1.250 |
| 2036941 | 130HL | 1.250 to 1.300 |
| 2036219 | 131HL | 1.300 to 1.350 |
| 2036088 | 132HM | 1.350 to 1.400 |
| 2036814 | 133HL | 1.400 to 1.450 |
| 2036996 | 134HM | 1.450 to 1.500 |
| 2035915 | 135HL | 1.500 to 1.550 |
| 2035653 | 136HL | 1.550 to 1.600 |
| 2036832 | 137HL | 1.600 to 1.650 |
| 2035183 | 138HL | 1.650 to 1.700 |
| 2035363 | 139HL | 1.700 to 1.750 |
| 2035507 | 140HL | 1.750 to 1.800 |
| 2035300 | 141HL | 1.800 to 1.850 |

**ASTM Metric Thermohydrometers**

Standard temperature 15°C, subdivisions 0.5kg/m3, length 380mm, thermometer scale °C: –20 to +65 (designation L), 0 to 85 (designation M), 20 to 105 (designation H)

| Catalog Number | ASTM Thermohydrometer No. | Density, Range kg/m3 |
|---|---|---|
| 2037257 | 300HL | 600 to 650 |
| 2035717 | 301HL | 650 to 700 |
| 2037852 | 302HL | 700 to 750 |
| 2035244 | 302HM | 700 to 750 |
| 2037634 | 303HL | 750 to 800 |
| 2035597 | 303HM | 750 to 800 |
| 2036036 | 304HL | 800 to 850 |
| 2035335 | 304HM | 800 to 850 |
| 2035165 | 305HL | 850 to 900 |
| 2036680 | 305HM | 850 to 900 |
| 2035373 | 306HL | 900 to 950 |
| 2037558 | 306HM | 900 to 950 |
| 2035214 | 307HL | 950 to 1000 |
| 2035790 | 307HH | 950 to 1000 |
| 2036923 | 308HH | 1000 to 1050 |
| 2035238 | 308HL | 1000 to 1050 |
| 2037565 | 309HH | 1050 to 1100 |
| 2036694 | 309HL | 1050 to 1100 |

# Water Content (Karl Fischer)

## Coulometric Karl Fischer Titrator

### Test Method

Determines low concentrations of water in a wide range of liquid, gas and powder samples. Used for assessing water content in petroleum and petrochemical products including oils, gasolines, solvents, and fluids as well as other products such as pharmaceuticals and cosmetics.

- ASTM D1533, D4928, D6304, IP 386, IP 438, API MPMS Chap. 10.9, BS 60814, ISO 10101-3, ISO 10337, ISO 12937
- Simple operation
- Multi-language display and print out
- Integral high-speed thermal printer
- Small footprint
- Automatic Compensation of Errors

### Coulometric Karl Fischer Titrator

The 2258126 offers new standards in versatility and ease of operation. Providing fast, accurate and reproducible determinations of water content in liquids, gases and powders. This easy to use titrator incorporates many state-of-the-art features. Designed to be equally suitable for meeting the routine needs of the Quality Control laboratory or the more demanding and varied requirements of research applications. Hard copies of results are provided by the built in high-speed thermal printer, along with statistics, data input parameters, sample ID numbers and time/date of analysis. At the heart of the 2258126 is state of the art ACE (Automatically Compensated Errors) control system. The ACE control system guarantees that the actual electrolysis current produced and the count rate displayed are always correctly synchronised, regardless of changes to the electrolysis cell resistance.

**Specifications**

Titration method: Coulometric Karl Fischer titration
Electrolysis control: Patented “ACE” control system
End point detection: AC polarisation
End point indication: Visual display/print out/acoustic beep

Display: 40 character alphanumeric backlit LCD
Measuring range (possible): 1µg – 100mg water
Measuring range (typical): 1µg – 10mg water
Moisture range: 1 ppm – 100%
Max. sensitivity: 0.1 µg
Max. titration speed: 2.0 mg per minute
Max. current: 400 ma
Drift compensation: Automatically controlled
Start delay time: 0 - 30 minutes, user selectable
End delay time: 0 - 30 minutes, user selectable
Power supply: 90-264VAC, 47-63Hz Universal input
Precision:10-100µg ±3µg, 100µg-1mg ±5µg, above 1mg ±0.5%
Calculation modes: Weight/weight, user programmable
Weight/dilution ratio, user programmable
Volume/density, user programmable
Volume/volume, user programmable
Display format: µg, mg/kg, ppm, %
Print format: µg, mg/kg, ppm, %
Statistics: max, mean, min values upto 99 runs
Method storage: 10 user programmable methods
Sample ID number: user programmable
Printer: 42 character high-speed thermal printer
Stirrer speed: Microprocessor controlled
Dimensions: 250 x 245 x 120 mm
Weight: 3 kg

CE

| Ordering Information | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Electrical Requirements** |
| **2258126** | Compact Coulometric Karl Fischer Titrator | 115-240V 50/60Hz |

| Accessories | |
|---|---|
| **Included Accessories -** LDC (Low Drift Cell) glassware pack comprising twin port titration vessel, detector electrode, generator electrode, desiccant tube, molecular seive, stirrer bar, injection septa, funnel & 1ml glass syringe with luer needle. | |
| **Catalog Number** | **Product Description** |
| **2042883** | Gas Analysis Kit (comprises gas inlet, gas outlet, seal ring & cap) |
| **2258127** | Carry Case |
| **2258128** | Reagents (Pack of 8 x 100ml anode reagent, 8 x 5ml cathode reagent, 1 x 0.1mg/ml & 1 x 1.0mg/ml water standards) |

## Volumetric Karl Fischer Titrator

### Test Method

Determines higher concentrations of water in a wide range of liquid and powder samples. Used for assessing water content in petroleum and petrochemical products including oils, gasolines, solvents, and fluids as well as other products in the Pharmaceutical, Cosmetic, Automotive, Food/Beverage and Agriculture industries.

### Volumetric Karl Fischer Titrator

- Intuitive keypad and function guide display
- Automatic and periodic elimination of bubbles which can form in the liquid circuit
- Automatic drift monitoring and compensation
- Flexible-can be used with different reagent brands
- 2 x 5mL syringes- one for the KF reagent and the other for automatic dosing of standard for the titre (second syringe can also be used for different factor reagent or special reagents for ketones, amines, etc.) Syringe volume dispensed in 40,000 steps
- 2 x built in pumps- one for dispensing the solvent and other for emptying the vessel
- 2 x electrovalves- fitted to top of each syringe, control flow direction of solvent and reagents
- Automatic rest cycle (stand-by mode) if not used for 15 minutes
- Programmable- several easy to use programs for titration and standardization
- Results expressed in ppm, mg/l, %, etc.
- Connects to external PC keyboard for easy text and sample information data entry
- Connects to different types of printers, PC's and balances
- Data Logger- automatic data storage of last 55 analysis results

The AKF6000 Compact Volumetric Karl Fischer Titrator is a versatile instrument capable of conforming to a multitude of Standard Test Methods. This fully programmable titrator offers several easy to use programs for titration and standardization. 4 standardization methods can be selected by the user. The AKF6000 then determines the reagent factor and automatically stores it in the titration programs. The AKF6000 is equipped with 2 Peristaltic Pumps capable of automatically dispensing a required volume of solvent into the
titration vessel as well as emptying the contents of the vessel directly into a waste container. The built in Drift Monitoring System automatically determines the vessel drift after a titration has concluded. This drift value is then deducted from a later titration. The AKF6000 will prompt the user if the measured drift value is greater than the programmed limit value.

### Specifications

Conforms to the specifications of:
ASTM D789, D803, D890, D1123, D1152, D1193, D1348, D1364, D1568, D1631, D2072, D2575, D3401, D4017, D4377, D4672, D5460, D5530, E180, E203
Non-volatile memory: Up to 10 titration programs, Clock/calendar,
Header texts: 2 lines x 40 characters
Name of up to 4 operators
Program comments: 8 lines x 40 characters
Up to 55 results stored in Data Logger
Languages: English Spanish, French, Latin
Display: Graphic backlit LCD, 128 x 64 dots
Keypad: Membrane, 7 keys, guaranteed up to 6 million strokes per key
Material: PET with protective treatment
Measuring ranges: From 0.1 mg up to 100% water
Syringe volume: Standard syringe 5mL
Resolution: 1/40000 of syringe volume
Dispensing accuracy: (as relative error) ≤0.2% for volumes higher than 10% of the syringe
Dispensing reproducibility: ±0.1% for volumes higher than 10% of the syringe
Liquid contact materials: Syringe: borosilicate glass and PTFE
Electovalve: PTFE and KEL-F
Tubes: PTFE
Inputs and outputs: Polarized electrode, BNC connector
For external keyboard, miniDIN connector
RS232C bidirectional for PC or printer, telephone connector
RS232C for balance, telephone connector
Stirrer control: On/Off and speed, RCA connector
Electrical Requirements: 90-264VAC, 47-63 Hz, 24V DC
Electrical safety: Meets EC, EN61010
EMC: Meets EC, EN 50081-2 and EN 50082-2
Permitted temperatures: Operating: 15-40°C
Storage: -10-50°C
≤≥<80%, relative humidity, non-condensing
Enclosure: ABS and enameled steel

### Included Accessories

Power supply 90-264VAC, 47-63Hz, 24 V DC
TLL SL syringe, 5mL (2)
Burette inlet tube with bottle cap, DIN 45 screw (2)
Burette outlet tube with antidiffuser device (2)
Drier cartridge with molecular sieve (5)
Inlet pump tube (for solvent dispensing) with bottle cap DIN 45 screw
Inlet & Outlet tubes with conical adapter (2)
Outlet pump tube with bottle cap DIN 45 screw
Support for electrode & tubes with magnetic stirrer and vessel
Double platinum electrode
Electrode cable with BNC connector
Pack (10) white O-rings

**Dimensions** wxdxh,in.(cm)
5-1/4x6-1/2x12(130x160x300)
Net Weight: 9 lbs. (4 kg)

**Ordering Information**

| Catalog Number | Product Description |
|---|---|
| **2286476** | AKF6000 Compact Volumetric Karl Fischer Titrator |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2286497** | Thermal printer CT-S280, 40 columns |
| **2286481** | Dot matrix printer |
| **2286482** | Standard PC keyboard |
| **2286498** | Software kit for communication between KF Titrator and PC, includes CD with software and cable |



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# Sampling

## Sample Thief (Bacon Bomb)

### Test Method

All samplers conform to ASTM D4057 (formerly ASTM D270), D6074 or ASTM D1265 specifications.

### Features and Benefits

- Obtains bottom samples or samples from any level
- Four different capacities
- Plated brass, stainless steel or acrylic construction
- Standard Viton O-ring seal
- Optional metal-to-metal seal

### Sample Thief (Bacon Bomb)

Obtains samples from storage tanks, tank cars and drums. When the thief strikes the bottom of the tank, a plunger assembly opens to admit the sample. The plunger closes again when the bomb is withdrawn, forming a tight seal. Samples can be taken at any depth with the use of a secondary trip line, or extension rods may be added for obtaining samples at levels of up to 18 (46cm) off the bottom. Equipped with plunger locking cam for tight closure during transport (except for 4 oz 1⅛" dia. model). Special models include a 4 oz (118mL) 'pencil' model for sampling through small diameter pipes and openings, and clear acrylic samplers with plated brass plunger and end pieces. Modified samplers can be supplied for special applications – we invite your inquiries

**Ordering Information - Sample Thief**

| Catalog Number | Capacity oz (mL) | Construction | Seal | Outside Diameter (O.D.) in. (cm.) | Overall Length in. (cm.) | Shipping Weight lbs (kg) |
|---|---|---|---|---|---|---|
| **1865158** | 32 (946) | plated brass | Viton O-ring | 3 3/8 (8.6) | 15 5/32 (38.5) | 13 (5.9) |
| **1402149** | 32 (946) | stainless steel | Viton O-ring | 3 3/8 (8.6) | 15 5/32 (38.5) | 13 (5.9) |
| **1186701** | 16 (473) | plated brass | Viton O-ring | 2 3/4 (7) | 12 1/32 (30.6) | 9 (4.1) |
| **1844104** | 16 (473) | plated brass | Metal Seat | 2 3/4 (7) | 12 1/32 (30.6) | 9 (4.1) |
| **1844102** | 16 (473) | stainless steel | Viton O-ring | 2 3/4 (7) | 12 1/32 (30.6) | 8 (3.6) |
| **1844103** | 16 (473) | acrylic | Viton O-ring | 2 3/4 (7) | 12 1/32 (30.6) | 8 (3.6) |
| **1186700** | 8 (237) | plated brass | Viton O-ring | 2 5/16 (5.9) | 10 5/32 (25.8) | 5 (2.3) |
| **1844101** | 8 (237) | plated brass | Metal Seat | 2 5/16 (5.9) | 10 5/32 (25.8) | 5 (2.3) |
| **1844099** | 8 (237) | stainless steel | Viton O-ring | 2 5/16 (5.9) | 10 5/32 (25.8) | 5 (2.3) |
| **1844100** | 8 (237) | acrylic | Viton O-ring | 2 5/16 (5.9) | 10 5/32 (25.8) | 5 (2.3) |
| **1844096** | 4 (118) | plated brass | Viton O-ring | 1 7/8 (4.7) | 9 11/16 (24.6) | 4 (1.8) |
| **1844097** | 4 (118) | stainless steel | Viton O-ring | 1 7/8 (4.7) | 9 11/16 (24.6) | 4 (1.8) |
| **1844098** | 4 (118) | plexiglass | Buna N O-ring | 1 5/8 (4.01) | 9 11/16 (24.6) | 3 (1.4) |
| **1186699** | 4 (118) | plated brass | Viton O-ring | 1 1/8 (2.8) | 13 1/4 (33.7 | 3 (1.4) |
| **1844094** | 4 (118) | stainless steel | Viton O-ring | 1 1/8 (2.8) | 13 1/4 (33.7 | 3 (1.4) |
| **1844095** | 4 (118) | acrylic | Viton O-ring | 1 1/8 (2.8) | 13 1/4 (33.7 | 3 (1.4) |

## Sample Thief Extension Rods

### Sample Thief Extension Rods

Installs in sample thief plunger assembly. Stainless steel with threaded end.

**Ordering Information -** Sample Thief Extension Rods

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2035919** | 1 (2.5) | 32, 16 and 8 oz mode |
| **2035386** | 2 (5.1) | 32, 16 and 8 oz models |
| **1186704** | 3 (7.6) | 32, 16 and 8 oz models |
| **1186705** | 6 (15.2) | 32, 16 and 8 oz models |
| **2036905** | 12 (30.5) | 32, 16 and 8 oz models |
| **1186703** | 18 (45.7) | 32, 16 and 8 oz models |
| **2036856** | 1 (2.5) | 4 oz models |
| **2038228** | 2 (5.1) | 4 oz models |
| **2037356** | 3 (7.6) | 4 oz models |
| **2036889** | 6 (15.2) | 4 oz models |
| **2038111** | 12 (30.5) | 4 oz models |
| **2036856** | 18 (45.7) | 4 oz models |

## All-Levels Sample Thief

### All-Levels Sample Thief

Similar to the standard 16 oz (473mL) Sample Thief (Bacon Bomb), but equipped with an adjustable needle valve opening instead of a plunger to control rate of flow during 'all-levels' and 'running' sampling from storage tanks. Plated brass construction.

## Ordering Information - All-Levels Sample Thief

**Ordering Information**

| Catalog Number | Product Description |
|---|---|
| **2021486** | All-Levels Sample Thief |

## Adjustable-Level Sample Thief

### Adjustable-Level Sample Thief

Similar to the standard 16 oz (473mL) Sample Thief (Bacon Bomb), but equipped with an adjustable needle valve opening instead of a plunger to control rate of flow during 'all-levels' and 'running' sampling from storage tanks. Plated brass construction.

**Ordering Information - Adjustable-Level Sample Thief**

| Catalog Number | Product Description |
|---|---|
| **2037391** | Adjustable-Level Sample Thief |

## Drum Thief (Sampling Tube)

### Test Method

All samplers conform to ASTM D4057 (formerly ASTM D270), D6074 or ASTM D1265 specifications.

### Features and Benefits

• Choice of plated brass or stainless steel construction

**Drum Thief (Sampling Tube)**

For tube sampling from barrels and drums. Takes bottom samples or all-levels samples. Maximum sample capacity of 24 oz (710mL).

**Dimensions** lxdia.,in.(cm)
1.25x40 (3.2x102)

**Shipping Information**
Shipping Weight: 6 lbs (2.7kg)

**Ordering Information**

| Catalog Number | Construction |
|---|---|
| 1186697 | Drum Thief, plated brass |
| 1844093 | Drum Thief, stainless steel |

## Weighted Beaker

### Test Method

All samplers conform to ASTM D4057 (formerly ASTM D270), D6074 or ASTM D1265 specifications.

### Features and Benefits

• Capacity 32 oz. (946mL)
• Choice of 3/4" or 1½" (19 or 38mm) opening

**Weighted Beaker**

For beaker sampling from tank cars, tank trucks, shore tanks, ship tanks and barge tanks. Copper or stainless steel construction with weighted bottom. Includes handle and chained cork. Takes all level samples, running samples, and top, upper, middle, lower and outlet samples. Select 3/4" (19mm) opening for light crude oils, light lubricating oils, kerosenes, gasolines, transparent gas oils, diesel fuels, and distillates, or 1½" (38mm) for heavy crude and fuel oils, heavy lubricating oils and nontransparent gas oils.

**Shipping Information**
Shipping Weight: 6 lbs (2.7kg)

**Ordering Information**

| Catalog Number | Construction |
|---|---|
| 1186698 | Weighted Copper Beaker, with 3/4" opening |
| 1402130 | Weighted Copper Beaker, with 1½" opening |
| 2036065 | Weighted Stainless Steel Beaker, with 3/4" opening |

## LPG Sample Containers

### Test Method

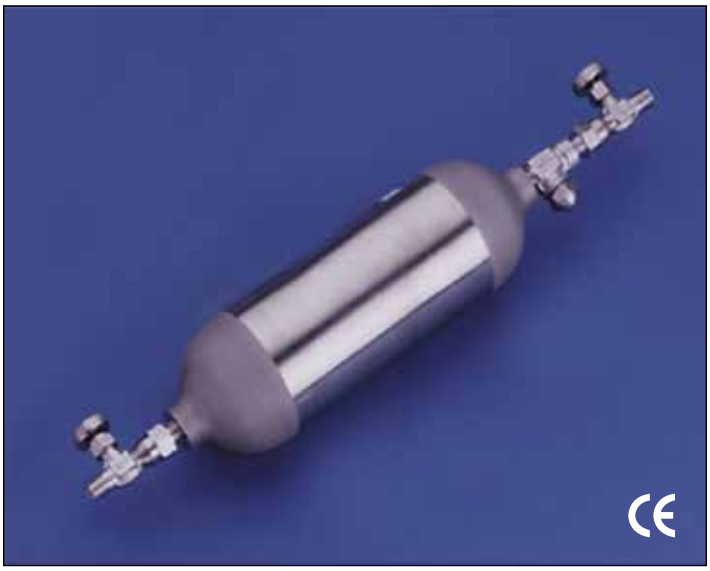
All samplers conform to ASTM D4057 (formerly ASTM D270), D6074 or ASTM D1265 specifications.

### Features and Benefits

- Two-valve type with 20% outage tube
- Built-in pressure relief valve
- Conforming to ASTM D1265 and GPA 2140 specifications

### LPG Sample Containers

Welded stainless steel cylinders for obtaining representative samples of liquefied petroleum (LP) gases. Two-valve type (1/4 IPS), with 20% outage tube and built-in pressure relief valve factory preset between 540 to 600psi (38-42 kg/cm2).



**Ordering Information**

| Catalog Number | Construction |
|---|---|
| **1844105** | LPG Sample Cylinder, 150mL |
| **1844106** | LPG Sample Cylinder, 300mL |
| **1796277** | LPG Sample Cylinder, 500mL |
| **1844107** | LPG Sample Cylinder, 1000mL |
| **1844108** | LPG Sample Cylinder, 3000mL |

## Tank Car Gauging Pole

### Features and Benefits

- Meets ASTM D1085 specifications
- 36" or 32⅛" in length, with 1/8" graduations

**Ordering Information**

| Catalog Number | Construction |
|---|---|
| **2035467** | Tank Car Gauging Pole, 36" |
| **2036920** | Tank Car Gauging Pole, 32⅛" |

# General Purpose Baths

## General Purpose Baths

### General Purpose Baths

- Accurate Microprocessor Control
- Three User-defined Temperature Preset Buttons
- Redundant Safety Backup
- Front Panel Lockout
- Electronic Calibration

Economical constant temperature water baths offer superior temperature control, range, and uniformity. Bath fluids can be controlled at temperatures as high as 100°C (60°C without cover) with 0.1°C precision and +/- 0.2°C uniformity. Bath temperature is displayed continuously on a bright, easy-to-read LED panel in your choice of °C or °F. Set point temperature is recalled with just the touch of a button. Three user-defined temperature preset buttons allow for quick selection of often used temperature set points. Dual thermostats provide optimum protection for your work and water bath. The high limit alarm alerts you if bath temperature exceeds your pre-set limit. A secondary Safety Set thermostat guards against thermal runaway, automatically disconnecting heater power should bath temperature get too high or the liquid level drop too low. The Constant Temperature Water Baths are also designed for operating convenience. The steeply gabled, polycarbonate cover accommodates glassware of varying heights and tilts out of your way when loading or removing samples, allowing condensate to drain neatly back into the bath.

**Specifications**

Temperature Control: 0.1°C setpoint and C°/F° switchable LED display
Temperature Stability: +/- 0.2°C
Temperature Range: Ambient to 100°C with cover,
Ambient to 60°C without cover

**Ordering Information**

| Catalog Number | Capacity | Electrical Requirements | Overall Dimensions LxWxH | Opening Dimensions LxWxH | Shipping Weight |
|---|---|---|---|---|---|
| **2346812** | 2L (0.5 gal) | 120V, 50/60Hz, 2.5A | 8.94x7.90x8.13 in | 5.31x5.88x5.81 in | 11 lbs |
| **2352456** | 2L (0.5 gal) | 240V, 50/60Hz, 1.25A | 22.71x20.07x20.65 cm | 13.49x14.94x14.76 cm | 4.99 kg |
| **2352499** | 2L shallow (0.5 gal) | 120V, 50/60Hz, 2.5A | 9.44x13.65x8.13 in | 5.81x11.69x2.50 in | 12 lbs |
| **2352457** | 2L shallow (0.5 gal) | 240V, 50/60Hz, 1.25A | 23.98x34.67x20.65 cm | 14.76x29.69x6.35 cm | 5.44 kg |
| **2352500** | 5L (1.3 gal) | 120V, 50/60Hz, 4.2A | 9.44x13.65x8.13 in | 5.94x11.75x5.94 in | 15 lbs |
| **2283092** | 5L (1.3 gal) | 240V, 50/60Hz, 2.1A | 23.98x34.67x20.65 cm | 15.09x29.85x15.09 cm | 6.80 kg |
| **2352501** | 10L (2.6 gal) | 120V, 50/60Hz, 4.2A | 15.43x14.90x8.13 in | 11.69x12.75x5.94 in | 23 lbs |
| **2277775** | 10L (2.6 gal) | 240V, 50/60Hz, 2.1A | 39.19x37.85x20.65 cm | 29.69x32.39x15.09 cm | 10.439 kg |
| **2352502** | 20L (5.2 gal) | 120V, 50/60Hz, 8.3A | 15.19x21.65x8.13 in | 11.50x19.50x5.88 in | 30 lbs |
| **2352458** | 20L (5.2 gal) | 240V, 50/60Hz, 4.15A | 38.58x54.99x20.65 cm | 29.21x49.53x14.94 cm | 13.61 kg |
| **2352503** | 28L (7.3 gal) | 120V, 50/60Hz, 8.3A | 15.19x21.65x10.13 in | 11.63x19.56x7.94 in | 33 lbs |
| **2352459** | 28L (7.3 gal) | 240V, 50/60Hz, 4.15A | 38.58x54.99x25.73 cm | 29.54x49.68x20.17 cm | 14.97 kg |

## General Purpose Baths

### General Purpose Baths

- Above Ambient Temperature Control
- Available in Three Different Capacities: 6, 13, and 28 Liter
- Large Reservoir Opening
- Microprocessor temperature control with °C/°F digital temperature set and display
- Adjustable Over-Temperature protection and Low-Liquid Cutoff.

**Programmable Model** - Constant temperature circulating bath provides precise temperature control stability of ±0.01°C and features time/temperature programming, remote probe capability, and a variable speed pressure/suction (duplex) pump. An RS232 interface and PC programming software are standard while LabView™ drivers and Excel® macros provide even greater programming and data logging convenience. A full graphic LCD display and multi-language help menus simplify operation and set-up.

**Standard Model** - Economical constant temperature circulating bath model. Microprocessor temperature control ranges from 5°C to 150°C with ±0.05°C stability. This model features a bright set-and-read LED display with a readout accuracy of ±0.5°C, three user-defined set point buttons, and a 2-speed pressure (simplex) pump suitable for closed loop applications.

CE

**Ordering Information**

| Catalog Number | Capacity | Electrical Requirements | Overall Dimensions LxWxH | Opening Dimensions LxWxH | Shipping Weight |
|---|---|---|---|---|---|
| **2297926**<br>**2301663**<br>**Standard** | 6L (1.6 gal)<br>6L (1.6 gal) | 120V, 50/60Hz<br>240V, 50/60Hz | 14.25x8.25x8.14 in<br>37.5x21x35.6 cm | 5.25x5.25x5.5 in<br>13.3x13.3x14 cm | 24 lbs<br>11 kg |
| **2352504**<br>**2352460**<br>**Programmable** | 6L (1.6 gal)<br>6L (1.6 gal) | 120V, 50/60Hz<br>240V, 50/60Hz | 14.25x8.25x8.14 in<br>37.5x21x35.6 cm | 5.25x5.25x5.5 in<br>13.3x13.3x14 cm | 30 lbs<br>14 kg |
| **2352505**<br>**2352461**<br>**Standard** | 13L (3.4 gal)<br>13L (3.4 gal) | 120V, 50/60Hz<br>240V, 50/60Hz | 15.5x10.88x14.75 in<br>39.4x27.6x37.5 cm | 5.25x8.5x7.75 in<br>13.3x21.6x19.7 cm | 31 lbs<br>14 kg |
| **2346813**<br>**2352462**<br>**Programmable** | 13L (3.4 gal)<br>13L (3.4 gal) | 120V, 50/60Hz<br>240V, 50/60Hz | 15.5x10.88x14.75 in<br>39.4x27.6x37.5 cm | 5.25x8.5x7.75 in<br>13.3x21.6x19.7 cm | 40 lbs<br>18 kg |
| **2352506**<br>**2352463**<br>**Standard** | 28L (7.3 gal)<br>28L (7.3 gal) | 120V, 50/60Hz<br>240V, 50/60Hz | 22.75x13.19x14.75 in<br>55.8x33.5x37.5 cm | 12.13x10.38x8 in<br>30.8x26.4x120.3 cm | 42 lbs<br>19 kg |
| **2352507**<br>**2352464**<br>**Programmable** | 28L (7.3 gal)<br>28L (7.3 gal) | 120V, 50/60Hz<br>240V, 50/60Hz | 22.75x13.19x14.75 in<br>55.8x33.5x37.5 cm | 12.13x10.38x8 in<br>30.8x26.4x120.3 cm | 50 lbs<br>23 kg |

**Specifications**

Temperature Range:
**2352504**, **2352460**: +5°C to 200°C
All Other Models: +5°C to 150°C
Temperature Stability:
Programmable Model: ±0.01°C
Standard Model: ±0.05°C
Readout Accuracy:
Programmable Model: ±0.25°C
Standard Model: ±0.5°C
Temperature Readout: °C or °F

Pressure Flow Rate:
Programmable Model: 30 lpm max. (60 Hz)
22 lpm max. (50 Hz)
Standard Model: 2-speed, 9 or 15 lpm
Suction Flow Rate:
Programmable Model: 22 lpm max. (60 Hz)
15 lpm max. (50 Hz)
Standard Model: N/A
Heater:
Programmable Model: 1100 Watts (60 Hz)
2200 Watts (50 Hz)
Standard Model: 1100 Watts (60 Hz)
1600 Watts (50 Hz)

## Refrigerated Constant Temperature Circulating Baths

### Refrigerated Constant Temperature Circulating Baths

- Standard Digital and Programmable models
- 6L, 13L and 28L models
- Easy-Access Reusable Filter
- Adjustable Over-Temperature Cutoff and Low-Liquid Cutoff
- Temperature readout in °C or °F

**Programmable Model**-In addition to high temperature capability, the Refrigerated Constant Temperature Circulating Baths feature exceptional cooling ability. The 13L and 28L models feature an energy saving modulating refrigeration control system. This permits fast bath cooling even at high temperatures without excessive energy consumption. The programmable model offers the widest temperature range along with high stability and variable speed pressure/suction (duplex) pump. RS232 interface and software for PC programming are standard. Labview™ drivers and Excel® macros offer even greater programming and data logging convenience. The full graphic LCD display with multi-language help menus aid in operation and set-up.

**Standard Model** - The Standard Refrigerated Constant Temperature Circulating baths offer the same cooling capacity as their programmable counter part. The standard digital controller is equipped with three user-defined temperature preset buttons for rapid set point changes. The bright LED display provides read and set capability, plus ±0.05°C temperature stability. The pump is 2-speed pressure (simplex) type is suitable for closed loop applications.

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## Compact Recirculating Chillers

### Compact Recirculating Chillers

- 400 watts of cooling at -10°C
- Highly economical cooling for rotary evaporators, lasers, chromatography equipment, and other sensitive laboratory devices
- Simple Installation, operation, and maintenance
- Built-in high temperature and low flow rate alarms

Compact Recirculating Chillers maximize precious bench space while providing 400 watts of cooling at -10°C. An environmentally-friendly and economical alternative to costly tap-water cooling, this powerful compact chiller is also well suited for cooling chromatography equipment, lasers, and other laboratory equipment.

**Specifications**

Pump Type: Turbine or Magnetic Drive (Centrifugal)
Temperature Range: -20°C to +20°C (-4°F to +68°F)
Temperature Stability: ±0.1°C (±1.8°F)
Cooling Capacity at -10°C: 400 watts (1365 BTU/hr)
Alarms: User-settable high temperature;
Fixed low flow (below 0.5 GPM / 1.9 LPM)
Reservoir Capacity: 0.7 Gallon (2.65 Liter)
Dimensions: 18.5 x 9.6 x 23.4 in. (47 x 24.4 x 59.4 cm)
Shipping Weight: 76 lbs (34.5 kg)

**Ordering Information**

| Catalog Number | Electrical Requirements | Pump Type | Max. Pump Flow lpm (gpm) | Max. Pump Pressure psi (kPa) |
|---|---|---|---|---|
| **2346814** | 120V, 60Hz | Magnetic Drive | 14.7 (3.9) | 8 (55) |
| **2352473** | 230V, 60Hz | Magnetic Drive | 13 (3.4) | 5.5 (38) |
| **2352508** | 120V, 60Hz | Magnetic Drive | 13.3 (3.5) | 14.5 (100) |
| **2352474** | 230V, 60Hz | Magnetic Drive | 11.5 (3) | 10 (69) |
| **2352509** | 120V, 60Hz | Turbine | 9.9 (2.6) | 38 (262) |
| **2352475** | 230V, 60Hz | Turbine | 8 (2) | 25 (169) |

# Muffle Furnaces

## Programmable Muffle Furnaces

### Test Method

Determines the amount of ash in distillate and residual fuels, gas turbine fuels, crude oils, lubricating oils, waxes, and other petroleum products.

### Features and Benefits

- Three capacity options
- Up to 12 heating/cooling ramps or dwell periods available
- Achieves 2 to 4 complete air changes per minute

## Programmable Muffle Furnaces

The Programmable Muffle Furnace combines microprocessor control with state-of-the-art construction and forced draft capability. They are ideal for ashing a variety of samples, including petroleum products, food, pharmaceuticals, chemicals, and paper. They can also be used as standard muffle furnaces for firing or annealing glass or ceramic specimens, solid-state inorganic reactions, rock and mineral fusions, sample drying, and tempering.

### Specifications

Conforms to the specifications of: ASTM D482, D874, D1026, D3174, D4422; IP 4, IP 163; ISO 3987, ISO 6245; NF M 07-045; DIN 51352, DIN 51575

Capacity: 0.14, 0.58, and 1.26 cu. ft. (0.004, 0.016, 0.036m3)

Temperature Range: ambient to 1125°C (2057°F)

Setpoint Repeatability: ±1°C (±2°F)

Setpoint Accuracy: ±4°C (±7°F)

Temperature Uniformity:

0.14 cu. ft. model: ±5°C (±9°F)

0.58 cu. ft. model: ±8°C (±14°F)

1.26 cu. ft. model: ±10°C (±18°F)

Number of Air Exchanges per Minute:

0.14 cu. ft. model: 4

0.58 cu. ft. model: 3

1.26 cu. ft. model: 2

### Electrical Requirements

208-240V 50/60Hz

120V, 50/60Hz

**Dimensions** lxwxh,in.(cm)

0.14 cu. ft. model: 19.4x14.5x19.5 (49x37x50)
Net Weight: 60 lbs (27kg)

0.58 cu. ft. model: 23.4x21.5x21.5 (59x55x55)
Net Weight: 90 lbs (41kg)

1.26 cu. ft. model: 23.4x21.55x28.5 (59x55x72)
Net Weight: 110 lbs (50kg)

### Ordering Information

| Catalog Number | Product Description | Capacity, cu. ft. | Electrical Requirements |
|---|---|---|---|
| **Programmable Muffle Furnace, Forced Draft Models** | | | |
| **2059227** | Programmable Forced Draft Muffle Furnace | 0.14 | 120V 50/60Hz - Single Phase, 14.2A |
| **2059227** | Programmable Muffle Furnace | 0.14 | 208-240V 50/60Hz - Single Phase, 7.1A |
| **2281809** | Programmable Muffle Furnace | 0.58 | 208-240V 50/60Hz - Single Phase, 12.5A |

### Additional Accessories

| | |
|---|---|
| **2352510** | Exhaust Tubing for Port Kit |
| **2352511** | Muffle Furnace Port Kit |
| **2352512** | Freestanding Shelf with Legs (For use with 0.58 and 1.26 cu. ft.furnace; 0.58 cu. ft. furnace takes one shelf, 1.26 cu. ft.furnace takes two shelves) |
| **2352513** | Flat Ceramic Shelf (replacement flat shelf for 1.26 cu. ft. furnace |

# Other General Testing Equipment

## Total Acid Number of Petroleum Products by Potentiometric Titration

### Test Method

For determination of acidic constituents in petroleum products, lubricants and transformer insulating oils soluble or nearly soluble in mixtures of toluene and propan-2-ol. It is applicable for the determination of acids whose dissociation constants in water are larger than 10-9. The test may be used to indicate relative changes that occur in oil during use under oxidizing conditions regardless of the color or other properties of the resulting oil.

### Automatic TAN Potentiometric Titrator

- Conforms to ASTM D664
- Very easy to use - intuitive keypad and function guide display
- Programmable - 3 easy to use programs depending on TAN content
- Results expressed in mg KOH/g
- 10ml high precision syringe - syringe volume dispensed in 40,000 steps
- Electrovalve fitted to top of syringe to control flow direction of reagent
- Connects to external pc keyboard for easy text and sample information data entry
- Connects to different types of printers, pc and balances
- Data Logger - automatic data storage of last 55 analysis results
- TAN Titrator applies differential measurement. Uses reference electrode with sleeve diaphragm refilled with LiCl 1 mol/L in ethanol and glass + Pt indicator electrode
- Equipped with (2) RS232C ports for connection to printer or PC and for connection to balance

The Automatic TAN Potentiometric Titrator has been designed to offer maximum specifications and features whilst being priced at a very competitive level. Standard operation of the titrator begins with the calibration of the electrodes with an aqueous pH 11 buffer. If the electrodes are in poor the condition, the titrator is capable of detecting this and automatically fails the calibration. Upon successful calibration, the titrator determines the blank value for the titration solvent and automatically stores it in all internal titration programs. The instrument is now ready to perform the TAN analysis. Simply select the suitable titration program in accordance with the expected TAN value of the sample and start the titration. The results are expressed in mg KOH/g. They are stored in the data logger, displayed on the TAN titrator screen, and can also be sent to a printer or PC.

**Specifications**

Display: Graphic backlit LCD, 128 x 64 dots
Keypad: Membrane, 7 keys, guaranteed up to 6 million strokes per key
Syringe Volume: Standard syringe 10ml

Resolution: 1/40,000 of syringe volume
Dispensing Accuracy: (as relative error) 0.2% for volumes higher than 10% of syringe
Liquid Contact: Syringe: borosilicate glass, polyethylene tip and synthetic plunger
Non-volatile memory: Up to 55 results stored in data logger
Languages: English, Spanish, French, Italian
Materials: Electrovalve: PTFE and KEL-F.
Tubes: PTFE
Inputs and Outputs: Differential measurement: 2 BNC connectors. For external keyboard, miniDIN connector.
RS232C bidirectional for PC or printer, telephone connector.
RS232C for balance, telephone connector
Stirrer Control: On/Off and speed, RCA connector
Enclosure: ABS and enameled steel
Permitted temperatures: Operating: 10 - 40°C
Storage: 10 - 50°C
80%, relative humidity, non-condensing
Electrical Safety: Meets EC, EN 61010
EMC: Meets EC, EN 50081-2 and EN 50082-2
Power supply: 90-264 V AC, 47-63 Hz

**Dimensions** lxwxh,in.(cm)
31x25.8x14.3 (78.74x65.53x36.32)
Net Weight: 98 lbs (44.5kg)



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| Ordering Information | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2333913** | Automatic Compact TAN Potentiometric Titrator 90-264V, 47-63 Hz |

| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2333926** | Software Kit for Communication between AN Titrator and PC<br>Includes: Software CD, DB-9 Connector, USB License Key |
| **2333928** | Thermal Printer, 40 Columns, RS232 Interface |
| **2333929** | Dot Matrix Printer, 40 Columns, RS232 Interface |
| **2333930** | Standard PC Keyboard, Mini-DIN connector |

# Micro Conradson Carbon Residue and Ash Tester

## Micro Conradson Carbon Residue and Ash Tester

- Maximum Test Temperature: 800°C
- 2 Preset methods: Micro-Carbon and Ash Tests
- Provision for creating 18 additional methods with 4 heating segments each
- Data Storage: 200 Results
- Quick access to calibration parameters Auto Diagnostic
- Automatically controlled atmosphere
- Data Logger - automatic data storage of last 55 analysis results

The Micro Conradson Carbon Residue and Ash Tester features a display screen that allows for friendly and easy use of the apparatus. All access to the calibration, maintenance, language selection, and safety parameters are achieved through the keyboard and protected by a password. A manometer located in the front of the instrument displays the admitted pressure and a flow meter reads the gas flow in the oven. Each solenoid valve can be either manually or automatically activated. The detailed test reports can be printed out in 40 or 80 columns or read on the display screen. Initial and final weights can be added to test reports and the carbon residue will automatically be calculated at the end of the test. The instrument provides a front access to a condensing pot for easy cleaning of all ducts between the oven, the pot, and the chimney using the supplied accessory. The instrument is equipped with a RS232 connection for data transfer to s supervisor or LIMS system. In addition, the ticket printer (delivered with the apparatus) can be connected to a parallel output.

## Test Method

Determines the amount of carbon residue formed after evaporation and pyrolysis of petroleum materials under certain conditions and is intended to provide some indication of the relative coke forming tendency of such materials.

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**Specifications**

Conforms to the specifications of: ASTM D4530, D482, D189; IP 398; ISO 10370, ISO 6615; DIN 51551

**Dimensions** lxwxh,in.(cm)

24.8 x 16.9 x 18.9 (63 x 43 x 48)

Net Weight: 77.2 lbs (35 kg)

**Included Accessories**

3 Vial Holders: Large, Small, and Mixed

Cleaning Cable

Hook for safe hot lid manipulation

Pipes for gas connection

Supervisor software and serial connection

Extension pipe for exhaust chimney

SEIKO ticket printer

Vials must be ordered separately

| Ordering Information | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2352514** | Micro Carbon Residue and Ash Tester, 230V 50-60Hz |

| Consumables | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2352535** | 16 ml vials (pack of 144) for single use |
| **2352515** | 2 ml vials (pack of 144) for single use |
| **2352516** | 2 ml Brosilicate glass sample vial, single use (MRC test) |
| **2352517** | 16ml Borosilicate glass sample vial, single use (MRC test) |
| **2352518** | 2 ml Quartz sample vial, re-usable (Ash Content test) |
| **2352519** | 16 ml Quartz sample vial, re-usable (Ash Content test) |
| **2352520** | 4 ml Borosilicate glass sample tube (MRC test) |

| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2352521** | Gas Connection Kit - 2 Gas Outputs |
| **2352522** | Holder for 25-50-100 g Porcelain Crucibles |
| **2352523** | Pack of 6 Porcelain Crucibles, 120 ml, Tall Form |
| **2352524** | Pack of 6 Porcelain Crucibles, 40 ml, Tall Form |
| **2352525** | Pack of 6 Porcelain Crucibles, 80 ml, Low Form |

## Determination of Carbon Residue (Micro Conradson Method)

### Determination of Carbon Residue (Micro Conradson Method)

- Maximum Test Temperature: 550°C
- Temperature measurement Resolution: 1°C
- Furnace Cooling: by compressed air injection
- Automatically controlled atmosphere
- Maximum load of samples: 12 small vials / 6 large vials

### Test Method

Determines the amount of carbon residue formed after evaporation and pyrolysis of petroleum materials under certain conditions and is intended to provide some indication of the relative coke forming tendency of such materials.

**Specifications**

Conforms to the specifications of:

ASTM D4530; ISO 10370; IP 398; DIN 51551

Electrical Requirements:

230V 50/60Hz, 1500W

**Shipping Information**
Shipping Weight: 38 lbs (17.3kg)
Dimensions: lxwxh,in.(cm)
16x16x31 (40.6x40.6x78.8)

**Dimensions** lxwxh,in.(cm)
9.8x11.8x23.6 (25x30x60)
Net Weight: 33 lbs (15kg)

**Included Accessories**
Small Vial Holder
2 mL Borosilicate Vial (12)
Cleaning Cable
Basket Handle

**Ordering Information**

| Catalog Number | Product Description |
|---|---|
| **2316272** | Micro Carbon Residue Tester, 230V 50/60Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2352526** | Holder for 2 ml vial (12 places) |
| **2352527** | Solenoid valve for nitrogen |
| **2352528** | Solenoid valve for air |
| **2352529** | Regulation thermocouple |
| **2352528** | Spare Static Relay |
| **2352531** | Condensate Trap - made of Glass |
| **2352532** | Condensate Trap - made of Brass |

**Consumables**

| Catalog Number | Product Description |
|---|---|
| **2352533** | Holder for 16 ml vial (6 places) |
| **2352534** | Holder for both 16 mL and 2 mL vials (7 places) |
| **2352535** | 2 ml Borosilicate glass sample vial, single use (MRC test) |
| **2352517** | 16ml Borosilicate glass sample vial, single use (MRC test) |
| **2352518** | 2 ml Quartz sample vial, re-usable (Ash Content test) |
| **2352519** | 16 ml Quartz sample vial, re-usable (Ash Content test) |
| **2352517** | 16 mL vials (pack of 144) for single use |
| **2352518** | 2 mL vials (pack of 144) for single use |
| **2352520** | 4 mL Borosilicate glass sample tube (ISO 10370 and IP 398)<br>Outside dia.: 12 mm / Height: 72 mm |

## Salts in Crude Analyzer

### Test Method

Salt content is determined by measuring the conductivity of a solution of crude oil in a polar solvent when subjected to an alternating electrical current and is obtained by comparison of the resulting conductance to a calibration curve of known salt mixtures.

### Electrometric Salt Determinator

- Conforms to ASTM D3230 test specifications
- Measures salt content, conductance, and temperature of crude oil samples, and pH measurements of aqueous samples

• Portable for field or laboratory testing with up to 8 hours of continuous operation from internal Ni-Cd rechargeable batteries
• 18-bit analog-to-digital converter for high precision
• 24Kb RAM dedicated for data storage (about 500 test results)
• Data can be uploaded in a comma delimited format to a PC with easy to use Windows® 2000/XP/Vista – based software via an RS232 serial data port Determines the salt content, conductance, and temperature of crude oil samples according to ASTM D3230 specifications. Utilizes the latest low-voltage, synchronous detection technology for conductivity measurements and a high-accuracy thermistor array to measure sample temperature. Automatically calculates salt concentration directly from acquired temperature and conductivity values. Measures conductivity over four ranges 0-2, 2-20, 20-200, and 200-1500 mS with automatic range selection. Self-calibration feature allows operator to adjust for any drift without re-entering standard temperature curves. Complete data storage of test results which is limited only by the hard drive capacity of external PC. Easy-to-read alpha-numeric display shows any four of the following parameters at one time as chosen by the operator: salts, conductance, conductance @ 25°C, pH, pH millivolts, temperature (°C or °F), internal and external battery voltages, date, time, logging ID, and ID increment value.

**Dimensions** lxwxh,in.(cm)
9x4.25x2.5 (23x10.8x6.5)
Net Weight: 2 lbs (1kg)

**Shipping Information**
Shipping Weight: 6 lbs (2.75kg)
Dimensions: 1.5 Cu. ft.

| Ordering Information | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Electrical Requirements** |
| **2275424** | Salt in Crude Analyzer | 115/230V 50/60Hz |

## Water and Sediment Determination in Crude Oil by Portable Centrifuge

### Test Method

For the determination of water and sediment of crude oil by centrifuge method during field custody transfers. This test method is considered the most practical method for field determination of sediment and water.

### Water and Sediment Determination in Crude Oil by Portable Centrifuge

• Accommodates two 6" conical centrifuge short tubes
• Analog Speed Control
• Integrated Tube Holder (2) and Pre-heater (2)
• Independent Digital Temperature Displays for both the Bowl and Pre-heater temperature
• Switchable Temperature Display between °C and °F
• Substantial Insulation for Reduced Heat Loss
• 12V DC Power Requirement for field use
• Opening in Top Lid for Speed Calibration by Portable Laser Tachometer

**Specifications**
Conforms to the specifications of:
ASTM D96; IP MPMS Chapter 10.4
Test Capacity: Two (2) short cone centrifuge tubes
Speed Range: 300 – 1800 RPM
RCF Range: 20 - 700
Temperature Control: Ambient to 140°F (60°C)

Temperature Readout: Two (2) Independent Digital Displays for Centrifuge Bowl and Pre-Heater
Electrical Requirement:
12V DC 40A

**Dimensions** wxdxh,in.(cm)
18x22.5x10 (45.72x57.15x25.4)
Net Weight: 50 lb (22.7kg)

**Ordering Information**

| Catalog Number | Product Description |
|---|---|
| **2346838** | Portable Heated Oil Test Centrifuge, 12V DC 40A |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2037695** | Centrifuge Tube, Short, 100mL, 6”, marked in 200 parts every 4 parts above 20mL |
| **2036282** | Centrifuge Tube, Short, 100mL, 6”, marked in mL |
| **2036379** | Centrifuge Tube, Short, 100mL, 6”, marked in mL every 2mL above 10mL |
| **2037406** | Centrifuge Tube, Short, 100ml, 6”, marked in 200 parts |
| **2035107** | Cork Stopper |

## Water and Sediment Determination by Automatic Centrifuge

### Test Method

Centrifugation provides a convenient means of determining sediment and water content in crude oil, fuel oils, middle distillate fuels, and biodiesel. Also used in determining the precipitation number, demulsibility characteristics, trace sediments, and insolubles in used lubricating oils.

### Automatic Heated Oil Test Centrifuge

- Choice of long, short, pear, or finger rotor assembly to accommodate corresponding centrifuge tubes
- Accommodates four (4) centrifuge tubes of 6 or 8” conical ASTM types, long, short, pear or finger tubes
- Automatic control of acceleration ramp, centrifugation speed, and timing functions.
- 4-1/2” LCD Touch Screen Control Panel
- Substantial Insulation for Reduced Heat Loss
- Self balancing, Quiet Operation
- Large, clear, top opening lid
- Class 1, Division 2 explosion resistant rating

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Fully automatic bench top centrifuge designed expressly for petroleum testing applications. Features a 4-1/2" LCD touch screen control panel. This integrated touch screen can be used to turn the heat on and off, set the duration of the test, set the RCF/RPM values and choose the type of rotor assembly and corresponding glassware to be used during the test. The Servoed motor speed mechanism allows the user to simply set the desired speed and the instrument will attain that speed. This mechanism calculates RPM based on the given RCF and type of Rotor selected. The large, clear, top opening lid provides for easy access to the rotor and tube holders and for cleaning of the unit. The lid has a 18-1/2" diameter viewing window allowing the operator to view inside the chamber for checking the status of the rotor and checking for possible spillage of the centrifuge tubes. Molded PTFE cushions provide for maximum protection and easy positioning of the tubes.

## Safety Features

The Centrifuge comes equipped with a Safety Lockout Mechanism. Upon emergency shutdown the door is locked and cannot be unlocked until the unit comes to a complete stop, the unit is turned back on, and the stop/unlock key is pressed on the touch screen display. Furthermore, the centrifuge cannot start while the door of the chamber is open and the latch is not engaged. The "Nitrogen Purge" feature allows for a slow release of Nitrogen into the bowl of the centrifuge. This feature requires an external Nitrogen Gas source and can easily connect to an Inlet port located at the back of the unit

### Specifications

Conforms to the specifications of:
ASTM D91, D96, D893, D1796, D1966, D2273, D2709, D2711, D4007, D5546; IP 75, 145, 359; API 2542, 2548; ISO 3734; DIN 51793; NF M 07-020
Capacity: Four (4) oil test centrifuge tubes: long (100mL), short (100mL), pear (100mL), or finger tubes (12.5mL)
Maximum Speed: 2200 RPM
Maximum RCF: 1327 (long); 1170 (short); 865 (pear-shaped)
Timer: 0 to 999 min
Set Speed: 500 - 2200 RPM
Speed Readout: 0 - 2200 RPM
Temperature Control: ambient to 93°C (199°F)
Temperature Readout: Digital
Brake: Automatic Dynamic

### Electrical Requirements

S115V 60 Hz, 10A
230V 50/60 Hz, 5A

### Dimensions lxwxh,in.(cm)

31x25.8x14.3 (78.74x65.53x36.32)
Net Weight: 98 lbs (44.5kg)

### Shipping Information

Shipping Weight: 122 lbs (55.4kg)
Dimensions: 36x30x19in.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2272174** | Automatic Heated Oil Test Centrifuge | 115V 60Hz with Long Tube Rotor Assembly (RA) |
| **2272178** | Automatic Heated Oil Test Centrifuge | 230V 50/60Hz with Long Tube (RA) |
| **2272174** | Automatic Heated Oil Test Centrifuge | 115V 60Hz with Short Tube (RA) |
| **2272178** | Automatic Heated Oil Test Centrifuge | 230V 50/60Hz with Short Tube (RA) |
| **2272174** | Automatic Heated Oil Test Centrifuge | 115V 60Hz with Pear Tube (RA) |
| **2272178** | Automatic Heated Oil Test Centrifuge | 230V 50/60Hz with Pear Tube (RA) |
| **2272174** | Automatic Heated Oil Test Centrifuge | 115 V 60Hz with Finger Tube (RA) |
| **2272178** | Automatic Heated Oil Test Centrifuge | 230V 50/60Hz with Finger Tube (RA) |



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| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2272174** | Rotor Assembly for Long Tubes |
| **2022750** | Centrifuge Tube, Long, 100mL, 8", marked in mL (ASTM D91, D96, D893, D1796, D4007) |
| **2035383** | Centrifuge Tube, Long, 100mL, 8", marked in mL every 1mL above 10ml (ASTM D96, D4007) |
| **2037795** | Centrifuge Tube, Long, 100mL, 8", marked in mL every 1mL above 10ml (ASTM D96, D4007) |
| **2037587** | Centrifuge Tube, Cone-Shaped, 100mL with capillary tip capable of measuring 0.01 mL and readable by estimation to 0.005% (ASTM D2273, D2709) (2059203 cushion required for each tube) |
| **2038269** | PTFE cushion for Long Tubes |
| **2059203** | PTFE cushion for Long Tubes with capillary tip (Required for 2037587 tubes) |
| **2272174** | Rotor Assembly for Short Tubes |
| **2037695** | Centrifuge Tube, Short, 100mL, 6", marked in 200 parts every 4 parts above 20mL (ASTM D96) |
| **2036282** | Centrifuge Tube, Short, 100mL, 6", marked in mL (ASTM D96) |
| **2036379** | Centrifuge Tube, Short, 100mL, 6", marked in mL every 2mL above 10mL (ASTM D96) |
| **2037406** | Centrifuge Tube, Short, 100mL, 6", marked in 200 parts (ASTM D96) |
| **2054504** | PTFE cushion for Short Tubes |
| **2272174** | Rotor Assembly for Pear Tubes |
| **2036381** | Centrifuge Tube, Pear, 100mL, marked in mL (ASTM D1966) |
| **2054344** | Centrifuge Tube, Pear, 100mL, with tube tip having graduations of 0.01mL over the range 0 to 0.2mL (ASTM D2709) |
| **2035107** | Cork Stopper for Long, Short and Pear Tubes |
| **2272174** | Rotor Assembly for Finger Tubes |
| **2037407** | Centrifuge Tube, Finger Tube (API 2542) |
| **2036611** | Felt support for Finger Tube |
| **2037212** | Cork Stopper for Finger Tube |

## Free and Total Glycerin by Gas Chromatograph

### Free and Total Glycerin by Gas Chromatograph

- Ambient-to-400C temperature-programmable column oven
- Electronic Pressure Control (EPC) of all GC system gases, including carrier gas
- LED "at-a-glance" display of all temp, pressure, & voltage-controlled zones

Includes:

- Flame Ionization Detector (FID)
- MXT-500 Capillary Column (15M x 0.53mm ID, 0.15 µ)
- Single cold on-column injection port
- Single-channel USB 2.0-compliant data acquisition hardware

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- Single cold on-column injection port
- Single-channel USB 2.0-compliant data acquisition hardware
- PeakSimple data acquisition & control software for WinXP on IBM PC
- 6' USB 2.0 Cable (A to B)
- GC Accessory Kit
- Operation & Service Manuals
- Free software updates

### Test Method

For the quantitative determination of free and total glycerine in B-100 methyl esters by gas chromatography. The range of detection for free glycerine is 0.005 to 0.05 mass %, and total glycerine from 0.05 to 0.5

mass %. The sample is analyzed by gas chromatography, after silyating with N-methyl-N-trimethylsilytriflouracetamide (MSTFA).
Free and bonded glycerine content reflects the quality of Biodiesel. A high content of free glycerine may cause problems during storage, or in the fuel system, due to separation of the gylcerine. A high total glycerine content can lead to injector fouling and may also contribute to the formation of deposits at injection nozzles, pistons, and valves.

## Gas Chromatograph

The Biodiesel Gas Chromatography system is configured to perform and satisfy all of the requirements of ASTM D6584. Analysis takes about 25 minutes and is simple enough for an untrained operator to perform in the lab or in the field. The included PeakSimple Data System displays the calibrated results directly without off-line calculations.

**Specifications**
Conforms to the specifications of: ASTM D6584

**Dimensions** lxwxh,in.(cm)
19 x 14.5 x 12.5 (48.5 x 36.75 x 30.5)
Net Weight: 37 lbs (16.8 kg)

**Shipping Information**
Shipping Weight: 52.5 lbs (23.9 kg)
Dimensions: 4.9 Cu. ft.

CE

| Ordering Information | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2346816** | Free and Total Glycerin by Gas Chromatograph<br>BioDiesel Gas Chromatography System |

# Automated Flocculation Titrimeter

## Test Method

Samples of asphalt or heavy oil, or residuum are dissolved in toluene at various concentrations and titrated with iso-octane or n-heptane at controlled temperatures to determine the point of flocculation (asphaltene precipitation) and calculate the Heithaus compatibility parameters. These results are intended primarily as a laboratory diagnostic tool for estimating the colloidal stability or compatibility of asphalt, asphalt cross blends, aged asphalt, pyrolyzed asphalt and crudes, and heavy oil, or residuum. Compatibility influences important physical properties of these materials as well as the formation of coke which causes fouling in refining processes.

## Features and Benefits

- Complete instrument and data acquisition system
- Rapid, accurate and highly reproducible
- Determines blending insolubility and solubility numbers
- Generates the data to calculate the WRI Coking Index (patent pending) to predict the proximity to coke formation during heavy oil distillation and improve distillate yield

## Automated Flocculation Titrimeter

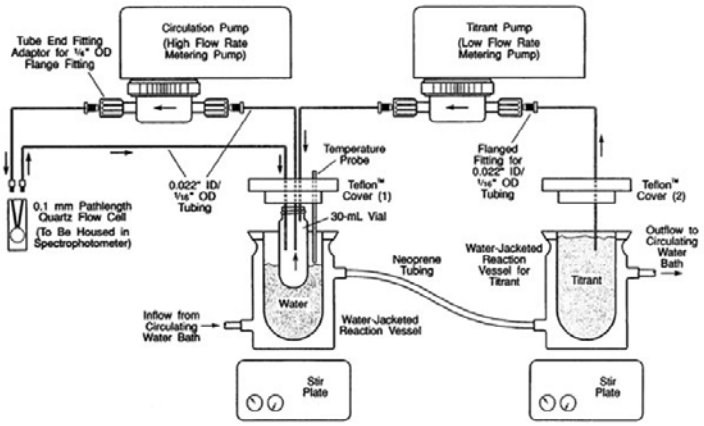
The Automated Flocculation Titrimeter (AFT) is a highly automated, computerized instrument that acquires oil stability and compatibility parameters directly. The AFT can be used to perform ASTM D6703 test method for Automated Heithaus Titrimetry. The AFT operates as a closed system with accurately controlled temperatures between 20-100°C, important for properly determining Heithaus compatibility parameters. The flocculation point is determined spectroscopically and the results are analyzed by the data acquisition system, virtually eliminating operator error in the interpretation of endpoints. The automated method is fast, accurate and very reproducible. The utility of the original Heithaus method has been expanded by developing multiple titration schemes. The software uses the data from the expanded method to predict the proximity to coke formation during heavy oil distillation. Many refiners stop distillation short of coke formation to avoid fouling in distillation equipment, tanks and transfer lines. The expanded AFT methodology allows the refiner to recover additional distillate without the fear of fouling.

## Major Applications

- **Blending of Oils and/or Asphalts**-One of the primary uses of Heithaus values is to predict the compatibility (P Index) of which oils and petroleum residua or asphalts can be mixed together for shipping, processing, or in formulations without causing phase separation. This is valuable to the refiner, researcher, or asphalt jobber who supplies petroleum asphalts for highway and roofing applications because it ensures that compatible asphalt blends are supplied. Incompatible asphalts show early failure in both applications.

**Coking Index (US Patent 6,773,921)**-Stability also influences coke formation in the refining process. Another major use for the AFT is to acquire the data needed to employ the Coking Index. The Coking Index is a quantitative measure of the proximity to coking (fouling) during visbreaking, distillation, transfer and storage of heavy oil. This allows the petroleum refiner to optimize heavy oil processing and to recover the maximum amount of distillate, and to stop the processing before fouling occurs.

**Solubility Parameter**-The solubility parameter at which asphaltenes begin to precipitate and the solubility parameter of the whole oil can be calculated from the AFT data.


Circulation Pump (High Flow Rate Metering Pump)
Titrant Pump (Low Flow Rate Metering Pump)
Tube End Fitting Adaptor for ¼" OD Flange Fitting
Temperature Probe
Flanged Fitting for 0.022" ID/ 1/16" OD Tubing
Teflon™ Cover (1)
Teflon™ Cover (2)
0.022" ID/ 1/16" OD Tubing
0.1 mm Pathlength Quartz Flow Cell (To Be Housed in Spectrophotometer)
30-mL Vial
Outflow to Circulating Water Bath
Neoprene Tubing
Water-Jacketed Reaction Vessel for Titrant
Water
Titrant
Inflow from Circulating Water Bath
Water-Jacketed Reaction Vessel
Stir Plate
Stir Plate

## Ordering Information

| Catalog Number | Product Description |
|---|---|
| **2258173** | Automated Flocculation Titrimeter 115V 50/60Hz |
| **2281810** | Automated Flocculation Titrimeter 220-240V 50/60Hz |

### Specifications

Conforms to the specifications of:
ASTM D6703
Temperature Range: 20 to 100°C

### Included Accessories

External Desktop PC with Data Acquisition Software
Fiber Optic Spectrometer with Multi-Bandpass Detector
High and Low Flow Rate Metering Pumps
Magnetic Stirring Plates
Programmable Circulator with External Probe to Monitor Jacket Temperature of the Sample
Reaction Vessels
Quartz Flow Cell with Temperature Stability Feature
Glassware
Thermometer Probes
Digital Variable Sample Circulator with Built in Reverse

### Shipping Information

Shipping Weight: 40 lbs (18.1kg)
Dimensions: 11 Cu. ft.

### Dimensions lxwxh,in.(cm)

Base/Support Assembly: 12x24x36 (30.5x61x91.4)



Phone: 281-496-0900 sales@expotechusa.com www.expotechusa.com

# Automatic Petroleum Refractometer

## Test Method

Refractive index is a fundamental physical property that is used in conjunction with other properties to characterize pure hydrocarbons and their mixtures. It is a useful property for concentration measurements, purity determinations and chemical identification.

## Features and Benefits

- Conforms to ASTM D1218, D1747, D5006, and D5775 test specifications
- Electronic heating and cooling twin Peltier system operates from 10 to 100°C, eliminating the need for a circulating water bath
- Automated and precise refractive index measurements
- Rugged sapphire prism
- Designed for samples ranging from clear to highly colored, dark and opaque
- Measures to the fifth decimal place refractive index or hundredths place in percent solids
- Clear graphical LCD display with on-screen instructions and full menu operation
- Multipoint calibration routines maximize accuracy
- Countdown timer insures consistent sample equilibration times
- RS232C communication ports

## Automatic Petroleum Refractometer

The Automatic Refractometer uses precision optics and superior image analysis to extend the repeatability and accuracy of refractive index measurements for petroleum products. Subjectivity is removed from tests results because no manual activities such as aligning shadowlines or reading analog scales are necessary. Opaque hydrocarbons present no problem for this unit which uses reflected light measurement technology as opposed to manual refractometers which are of the transmission type. The refractometer incorporates numerous innovations designed to improve the accuracy of petroleum product testing. A linear scanned diode array shadowline sensor is sensitive enough to read even the most demanding samples. A 589 nanometer filter gives true Sodium D-Line refractive index readings. A built-in twin Peltier heating and cooling system gives the instrument the capability of reading at up to 100°C without the need for an accessory water bath. The large graphical LCD is easy to read and provides complete sample analysis documentation including the reading, temperature and scale name of the screen. Documentation is also output through an RS232C serial port for export to either a PC or a parallel port to a standard printer. The instrument has an on-board data card for record storage. Optional Refractometer Communication Software package provides real-time output directly into Microsoft® Excel.

Set-up, diagnostic and calibration routines are displayed with easy to follow step-by-step instructions. User-developed customer calibration curves may be programmed allowing automatic temperature correction, direct percent concentration, percent reaction completion, etc. This unit has been used successfully throughout the petrochemical industry.

### Specifications

Conforms to the specifications of: ASTM D1218, D1747, D5006, D5775
Measurement Scales:
Refractive Index (RI)
BRIX (% sucrose)
Temperature Corrected RI
Temperature Corrected BRIX
Ten User-Programmable Scales

Illumination: 589nm light emitting diode with interference filter (estimated life: 100,000 hrs)
Range:
Dissolved Solids: 0 to 95% solids
Refractive Index: 1.29000 to 1.70000nD
(nD - Sodium D-Line Refractive Index)
Readability:
0.01% Solids 0.00001nD
Precision:
Refractive Index Standard Oils ± 0.00003
Typical clear aqueous samples, % Solids Temperature Compensated, as sucrose ±0.03%

Calibration Fluid: refractive index standard oil, NIST traceable nominal value 1.495 RI, 67.61 BRIX
Sample Types: Transparent, translucent or opaque
Prism Assembly: Stainless steel, synthetic sapphire sealed with solvent-resistant epoxy

Calibration:
1 point - Water only
2 point - Water and refractive index or Brix standard

**Dimensions** lxwxh,in.(cm)
15.5x12x4.5 (39.5x30.5x11.5)
Net Weight: 23 lbs (10.5kg)

### Shipping Information

Shipping Weight: 30 lbs (14kg)
Dimensions: 5 Cu. ft.

Phone: 281-496-0900 sales@expotechusa.com www.expotechusa.com

| Ordering Information | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Electrical Requirements** |
| **2023239** | Automated Flocculation Titrimeter 115V 50/60Hz | 115/230V 50/60Hz |
| **2024601** | Automatic Petroleum Refractometer without Data Storage Option for D1218 and D1747 | 115/230V 50/60Hz |

| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2297685** | Calibration Fluid Certificate of NIST traceability included. |
| **2297518** | Refractometer Communication Software Package with real-time data export into Microsoft® Excel. |

## Automatic Melting Point Range Apparatus

### Test Method

The melting point of a crystalline solid is the temperature at which the solid to liquid phase transition occurs, referenced at one atmosphere (1 ATM) of pressure.

### Features and Benefits

- Conforms to BP Appendix 5 - Method 6 and GLP specifications
- Readily interchanged between automatic and manual detection of melting point ranges
- Intelligent Lamp Intensity Control with Soft Start
- Storage capacity for up to 20 sample tests
- User-interactive software and data entry, including easy alphanumeric entry of sample name, ID number, and date
- User selectable operating modes: automatic and manual.

### Automatic Melting Point Range Apparatus

The Automatic Melting Point Range Apparatus is the latest technology for microprocessor-based determinations of melting point ranges of crystalline, powdered and polymeric materials, and is used to assess sample purity. Requires approximately 5mg of sample spread uniformly on a glass slide, covered with a glass coverslip. The slide is placed on a uniformly heated, round furnace and subjected to a heating profile as required by the user. Two user operating modes are available: automatic and manual. In the automatic mode, the start and end of melting point range is automatically detected by a photosensing device. In the manual mode, the start and end of melting point range can be selected manually with a key-press by the user. Sample melting point can be determined as per the BP method by the 'Heat & Cool' temperature function. The melting process is recorded and viewed on-screen in real-time by a CCD camera. Precise temperature control gives reproducible results to within 1%. The unit contains an automatic temperature safety cut-off feature if no melting points are detected 15°C above the expected melting point or if the oven reaches 315°C. The melting process is magnified, recorded, and viewed on-screen in real-time by a CCD camera. The change in physical appearance of the sample with respect to temperature is recorded, and the start/end of melting is observed automatically. A representation of the entire process can be printed out in graphical form for validation.

**Specifications**

Conforms to: BP Appendix 5-Method 6; GLP
Visual Image: 10x magnified displayed on monitor
Temperature Range: ambient + 5 to 315°C
Heating Rates: 0.2, 0.5, 1.0, 2.0, 3.0, 6.0, 12.0°C/min
Temperature Readability: 0.1°C
Cooling Time: 20 minutes (300°C to ambient)
Temperature Accuracy:
±0.5°C (ambient + 5 to 200°C)
±0.8°C (200 to 315°C)
Sample size: 5 mg (approx.)
Sample Holder: Glass Slide 1 ± 0.02mm thick
Sample Cover: Glass Coverslip 0.17mm thick

**Specifications**

Conforms to: BP Appendix 5-Method 6; GLP
Visual Image: 10x magnified displayed on monitor
Temperature Range: ambient + 5 to 315°C
Heating Rates: 0.2, 0.5, 1.0, 2.0, 3.0, 6.0, 12.0°C/min
Temperature Readability: 0.1°C
Cooling Time: 20 minutes (300°C to ambient)
Temperature Accuracy:
±0.5°C (ambient + 5 to 200°C)
±0.8°C (200 to 315°C)
Sample size: 5 mg (approx.)
Sample Holder: Glass Slide 1 ± 0.02mm thick
Sample Cover: Glass Coverslip 0.17mm thick

Temperature Sensor: Pt-100 (2 wire RTD)
Test Storage: Up to 20 tests with parameters

**Electrical Requirements**

115V, 60Hz, Single Phase
220V, 50Hz, Single Phase

**Dimensions** lxwxh,in.(cm)

Main Unit: 16.5x12.25x13 (42x31x33)
Monitor: 8x5.5x5.5 (20x14x14)
Net Weight: Main Unit: 22 lbs (10 kg)
Monitor: 1.8 lbs (0.8 kg)

**Shipping Information**

Shipping Weight: 29 lbs (13 kg)
Dimensions: 3.6 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2037838** | Automatic Melting Point Apparatus | 115V 60Hz |
| **2035686** | Automatic Melting Point Apparatus | 220V 50Hz |

## Automatic Aniline Point Apparatus

### Test Method

Aniline point is used to characterize pure hydrocarbons and to indicate the aromatic content of hydrocarbon mixtures. Equal volumes of aniline and sample or sample plus n-heptane are stirred together while being heated at a controlled rate. After the two phases become miscible, the mixture is cooled at a controlled rate and the temperature at which the two phases separate is the aniline point or mixed aniline point of the sample.

### Features and Benefits

- Conforms to ASTM D611 and related specifications
- For samples ranging from clear to very dark
- Temperature range 0° to 150°C (32 to 302°F)
- Digital temperature display

### Automatic Aniline Point Apparatus

Performs aniline point and mixed aniline point determinations automatically by means of a modified thin film technique (ASTM D611 Method E). The sample-aniline mixture is directly heated by a platinum immersion heater and the aniline point is detected photoelectrically. Temperature is displayed on a large LED indicator. Built-in pressure regulator and solenoid valve permit the use of cooling air for quicker cooling cycles or to determine subambient aniline point temperatures. Aniline points as low as 0°C (32°F) can be determined with the use of refrigerated cooling air. Equipped with variable controls for heater, light source and stirrer speed.

Cabinet exterior surfaces have a chemical resistant polyurethane enamel finish.

**Specifications**

Conforms to the specifications of:
ASTM D611; IP 2; ISO 2977; DIN 51775; FTM 791-3601;
NF M 07-021
Testing Range: 0 to 150°C (32 to 302°F)
Temperature Display: 0-999.9°C

**Electrical Requirements**

115V, 50/60Hz, Single Phase, 0.4A
220-240V, 50/60Hz, Single Phase, 0.2A

**Included Accessories**

Standard Pyrex™ Test Cell with drain

**Dimensions** lxwxh,in.(cm)
14.5x8.5x20.5 (37x22x53)
Net Weight: 32.5 lbs (14.7kg)

**Shipping Information**

Shipping Weight: 46 lbs (21kg)
Dimensions: 8.2 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **1716950** | Automatic Aniline Point Apparatus | 115V 50/60Hz |
| **1844038** | Automatic Aniline Point Apparatus | 220-240V 50/60Hz |

**Accessories**

| Catalog Number | Product Description | Temperature Range |
|---|---|---|
| **1797869** | ASTM 33F Thermometer | 36.5 to +107.5°F |
| **1797870** | ASTM 33C Thermometer | -38 to +42°C |
| **1797871** | ASTM 34F Thermometer | 77 to 221°F |
| **1797872** | ASTM 34C Thermometer | 25 to 105°C |
| **1797874** | ASTM 35F Thermometer | 194 to 338°F |
| **1797873** | ASTM 35C Thermometer | 90 to 170°C |
| **1796401** | Pyrex Test Cell with drain | |
| **1340195** | Heating-Cooling Tube with platinum element | |

## Thin Film Aniline Point Apparatus

### Test Method

Aniline point is used to characterize pure hydrocarbons and to indicate the aromatic content of hydrocarbon mixtures. Equal volumes of aniline and sample or sample plus n-heptane are stirred together while being heated at a controlled rate. After the two phases become miscible, the mixture is cooled at a controlled rate and the temperature at which the two phases separate is the aniline point or mixed aniline point of the sample.

### Features and Benefits

• Conforms to ASTM D611 and related specifications

### Thin Film Aniline Point Apparatus

For aniline point and mixed aniline point determinations according to Method B. Stirs aniline-sample mixture in a borosilcate glass thin film tube suspended in a heating bath. Thin film of mixture flows over a light well b illuminated by a variable 6V lamp. Adjust heating rate per specifications using accessory Powertrol Heater. When lamp filament brightens inside well, allow mixture to cool until the two phases separate as indicated by obscuring of the lamp filament. Consists of thin film tube; 400mL Pyrex™ beaker; cover assembly with bath stirrer, sample pump rotor and cooling coil; 6V lamp with line cord; and drive motor. Positive drive pulley system rotates sample and bath stirrers. Accessory Powertrol Heater has variabl

stepless control and a reference dial for repeatable control of heating rate. Porcelain refractory top plate shields 75OW heater and has a positioning well for the Pyrex™ bath. Low voltage receptacle in heater housing accepts line cord of 6V lamp.

**Specifications**

Conforms to: ASTM D611; IP 2; ISO 2977; DIN 51775; FTM 791-3601

Bath Medium: 400mL of heat transfer fluid (355-000-001 mineral oil is suitable for this application)

**Electrical Requirements**

115V, 50/60Hz, Single Phase, 6.5A
220-240V, 50/60Hz, Single Phase, 13.4A

**Included Accessories**

Thermometer Ferrules (2)
Clamps and Support Rod

**Dimensions** lxwxh,in.(cm)

14.5x18.5x20.5 (37x22x53)

Net Weight: 24 lbs (10.9kg)

Shipping Information

Shipping Weight: 42 lbs (19.1kg)

Dimensions: 5.7 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **1340194** | Thin Film Aniline Point Apparatus | 115V, 50/60Hz |
| **1844037** | Thin Film Aniline Point Apparatus | 220-240V, 50/60Hz |
| **1844033** | Powertrol Heater | 115V, 50/60Hz |
| **1844034** | Powertrol Heater | 220-240V, 50/60Hz |

**Accessories**

| Catalog Number | Product Description | Temperature Range |
|---|---|---|
| **1797869** | ASTM 33F Thermometer | 36.5 to +107.5°F |
| **1797870** | ASTM 33C Thermometer | -38 to +42°C |
| **1797871** | ASTM 34F Thermometer | 77 to 221°F |
| **1797872** | ASTM 34C Thermometer | 25 to 105°C |
| **1797874** | ASTM 35F Thermometer | 194 to 338°F |
| **1797873** | ASTM 35C Thermometer | 90 to 170°C |

## U-Tube Aniline Point Apparatus

### Test Method

Aniline point is used to characterize pure hydrocarbons and to indicate the aromatic content of hydrocarbon mixtures. Equal volumes of aniline and sample or sample plus n-heptane are stirred together while being heated at a controlled rate. After the two phases become miscible, the mixture is cooled at a controlled rate and the temperature at which the two phases separate is the aniline point or mixed aniline point of the sample

### Features and Benefits

• Developed by Standard Inspection Laboratories

### U-Tube Aniline Point Apparatus

Similar to the Thin Film Aniline Point Apparatus but with 'U-Tube' aniline-sample tube and stirrer as developed by Standard Inspection Laboratories. Suitable for samples having 6.5 or lighter ASTM D1500 color. As illustrated in IP2-56, Method D. Consists of U-Tube; 400mL Pyrex beaker; cover assembly with bath stirrer; sample stirrer and cooling coil; 6V lamp with line cord; and drive motor. Thermometer ferrules and mounting hardware are included. Accessory Powertrol Heater provides variable stepless control of heating rate and 6V tap for lamp.

**Specifications**

Conforms to the specifications of: ASTM D611; IP 2; ISO 2977; DIN 51775; FTM 791-3601

Bath Medium: 400mL of heat transfer fluid  mineral oil is suitable for this application)

**Electrical Requirements**

115V, 50/60Hz, Single Phase, 6.5A

220-240V, 50/60Hz, Single Phase, 13.4A

**Included Accessories**

Thermometer Ferrules (2)

Clamps and Support Rod

**Dimensions** lxwxh,in.(cm)

14.5x18.5x20.75 (37x22x53)

Net Weight: 24 lbs (10.9kg)

**Shipping Information**

Shipping Weight: 42 lbs (19.1kg)

Dimensions: 5.7 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **1844035** | U-Tube Aniline Point Apparatus | 115V, 50/60Hz |
| **1844036** | U-Tube Aniline Point Apparatus | 220-240V, 50/60Hz |
| **1844033** | Powertrol Heater | 115V, 50/60Hz |
| **1844034** | Powertrol Heater | 220-240V, 50/60Hz |

**Accessories**

| Catalog Number | Product Description | Temperature Range |
|---|---|---|
| **1797869** | ASTM 33F Thermometer | 36.5 to +107.5°F |
| **1797870** | ASTM 33C Thermometer | -38 to +42°C |
| **1797871** | ASTM 34F Thermometer | 77 to 221°F |
| **1797872** | ASTM 34C Thermometer | 25 to 105°C |
| **1797874** | ASTM 35F Thermometer | 194 to 338°F |
| **1797873** | ASTM 35C Thermometer | 90 to 170°C |

## Wickbold Combustion Apparatus

### Test Method

Determines total sulfur in liquefied petroleum (LP) gases and in liquid petroleum products by the Wickbold oxy-hydrogen burner method. Also suitable for burning butane-butene mixtures to determine trace amounts of volatile chlorides.

### Features and Benefits

• Conforms to ASTM D2384, D2784, D2785 and related specifications

### Wickbold Combustion Apparatus

Burns samples in a stainless steel oxy-hydrogen burner to determine total sulfur in petroleum products in the 0.1 to 300ppm range. Tests samples

which are viscous, highly aromatic or of high sulfur content with the use of appropriate solvents. Combustion chamber and stainless steel burner are housed in an insulated chamber with hinged heat-resistant and glare-proof shield for viewing burner flame. To ignite flame, depress electronic spark ignitor handle at side of unit. Ignitor shuts off when handle is released. Built-in pressure regulators with gauges allow for accurate adjustment and monitoring of hydrogen, oxygen and nitrogen pressure. Burner is easily disassembled for cleaning.

Supplied with a complete set of Pyrex™ and quartz glassware, including 200mL sample reservoir, sample capillary, combustion chamber, absorber, spray trap and cooling bulb, and compression-type gas connection fittings for .25" (6mm) O.D. tubing. Housed in a finished aluminum cabinet. For LPG, natural gas and refinery gas samples, order accessory sample adapter

**Specifications**

Conforms to the specifications of: ASTM D2384, D2747, D2784, D2785; GPA 2140; IP 243; ISO 4260; DIN EN 41; NF T 60-142

**Included Accessories**

Complete Glassware Set, Sample Capillary, Sample Reservoir, Combustion Chamber, Absorber Spray Trap, Cooling Bulb, Stainless Steel Burner

**Dimensions** lxwxh,in.(cm)
Cabinet only: 15x13x18.5 (38x33x47)
Net Weight: 40 lbs (18.1kg)

**Shipping Information**
Shipping Weight: 62 lbs (28.1kg)
Dimensions: 11.9 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2035081** | Wickbold Combustion Apparatus | 115V, 50/60Hz |
| **2036663** | Wickbold Combustion Apparatus | 220-240V, 50/60Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **1844035** | Gas Sample Adapter<br>For burning liquefied petroleum, natural and refinery gases in the Wickbold Apparatus.<br>Constructed entirely of stainless steel, with 150mL sample cylinder,<br>connecting tubing and all necessary valves and couplings. |
| **2019436** | Sample Capillary |
| **2019437** | Sample Reservoir |
| **1403439** | Combustion Chamber |
| **2019438** | Absorber |
| **2019439** | Spray Trap |
| **2036350** | Cooling Bulb |
| **1403440** | Stainless Steel Burner |

# Ramsbottom Carbon Residue Apparatus & Data Acquisition Software

## Test Method

Determines the 'carbon residue' left after evaporation and pyrolysis of a sample oil in the Ramsbottom furnace, providing an indication of the deposit forming tendencies of fuels and guidelines for the processing of refinery products.

## Features and Benefits

- Conforms to ASTM D524 and related specifications
- Microprocessor temperature control with digital display and over-temperature cut-off

**Electrical Requirements**

115V, 50/60Hz, Single Phase, 20.8A
220-240V, 50/60Hz, Single Phase, 10.9A

**Dimensions** lxwxh,in.(cm)
16x21.5x14.5 (41x55x37)
Net Weight: 64 lbs (29kg)

**Shipping Information**
Shipping Weight: 78 lbs (35kg)
Dimensions: 8.2 Cu. ft.

## Ramsbottom Carbon Residue Apparatus

Thermostatically controlled coking furnace for five samples. Cast-iron block type furnace reaches the standard test temperature of 550°C (1022°F) rapidly and controls with ±1°C stability. Microprocessor temperature control has °C/°F switchable digital setpoint and display. Operator and equipment are protected by an over-temperature control circuit which automatically interrupts power to the unit should block temperature exceed the programmed cut-off point. Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Contact your EXPOTECH USA representative for information. Heavily insulated stainless steel cabinet with three-layer refractory top provides excellent heat retention.

**Specifications**

Conforms to the specifications of: ASTM D524, D6074; IP 14; ISO 4262; FTM 791-5002; NF T 60-117
Furnace Type: Cast iron block
Capacity: 5 coking bulbs
Maximum Temperature: 650°C (1200°F)
Controller Sensitivity: ±1°C (± 2°F)
Heater: 0-2400W, ceramic band heater

## Ramsbottom Software

Ramsbottom Software retrieves temperature data and automatically performs calculations of carbon residue or carbon residue on 10% distillate as per ASTM D524 in real-time. Direct communication eliminates weighing errors and provides hands-free data acquisition. The sophisticated Windows®-based software package features an easy-to-navigate operation, a straightforward user interface, minimal draw on Windows® memory resources, automatic real-time data acquisition via RS232 connection, and a timer / stopwatch feature for general laboratory use.

The "test intelligent" software simplifies the testing process by providing sequential test prompts for assisting the operator with each step of the test procedure. The active zoom, pan, and trace feature allows the ability to change axes and the magnification of any sector of the pressure or temperature graphs to view data in greater detail. The final test data is exported with graphs and test parameters either directly to Microsoft® Excel, in ASCII file format for use with LIMS or any other spreadsheet programs, programs, or directly to a printer with a test report according to ISO guidelines. Test data is saved in a database format for determining test averages, standard deviations, and ASTM test repeatability. The software package requires no PC hardware installation and includes the software installation CD and computer connection cables.

**Computer Requirements**

PC Processor: Intel® Pentium II or similar (minimum)
Processor Speed: 500 MHz or higher
Operating System: Windows® 98 SE, 2000, NT, ME, XP

Memory (RAM): 64 Mb RAM (128 Mb RAM recommended)
Hard Disk Space: 15 Mb free space (minimum)
Communication Ports: one or two RS232 ports
Other Software: Microsoft® Excel (97 or above)

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **1452061** | Ramsbottom Carbon Residue Apparatus | 115V, 50/60Hz |
| **1844092** | Ramsbottom Carbon Residue Apparatus | 220-240V, 50/60Hz |
| **2331550** | Ramsbottom Data Acquistion Software | |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2038233** | Coking Bulb<br>Pyrex™, with capillary<br>Conforms to ASTM D524 specifications |
| **2035637** | Sample Charging Syringe |
| **2035087** | Needle, 18 gauge, 2” |
| **2036322** | Coking Bulb Filling Device<br>Convenient time saving device fills up to five coking bulbs at a time.<br>Ideal for viscous fluids that are difficult to handle at room temperature |
| **1409895** | Control Bulb<br>Stainless steel, with IC thermocouple.<br>May be used with a thermocouple pyrometer* to verify compliance of the furnace with ASTM performance requirements. |
| **2035591** | Digital Thermometer, 115V |
| **2035078** | Digital Thermometer, 220-240V |

*The 2035591 / 2035078 Digital Thermometer is suitable for this purpose

## Dual Corrosion Test Apparatus

### Test Method

Provides a laboratory screening procedure for evaluating the corrosion preventing capabilities of engine coolants under heat transfer conditions that may be encountered in aluminum cylinder head engines. Corrosion preventing effectiveness is determined by the change in weight of an aluminum alloy test specimen after an extended period at elevated temperature in the presence of a coolant sample.

### Features and Benefits

- Conforms to ASTM D4340 test specifications
- Operating range to 210°C

### Dual Corrosion Test Apparatus

Consists of two heat-transfer corrosion cells with temperature and pressure controls for evaluating engine coolant samples in accordance with

ASTM D4340. Maintains aluminum alloy specimens at constant temperature in the presence of 500mL samples. Each corrosion cell includes borosilicate glass test cell, heat transfer bar, aluminum test specimen with thermocouple port, Type J thermocouple, 950W band heater, pressure gauge, pressure relief valve, stainless steel end plates with support rods, fill plug and O-rings, and acrylic safety shields. Digital temperature controllers maintain specimens at temperatures of up to 210 ± 1°C throughout the test period. Test cells are mounted on a finished steel base. Controls are housed in a separate finished steel cabinet.

**Specifications**
Conforms to the specifications of: ASTM D4340
Test Capacity: 2 coolant samples
Maximum Temperature: 210°C ± 1°C

**Electrical Requirements**
115V 50/60Hz, 17A
220-240V 50/60Hz, 8.5A

**Dimensions** lxwxh,in.(cm)
Test Unit: 43x27x44 (109x62x112)
Control Cabinet: 10x14x12 (25x36x30)
Net Weight: 190 lbs (86.2kg)

**Shipping Information**
Shipping Weight: 327 lbs (148.3kg)
Dimensions: 46.7 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2037173** | Dual Corrosion Test Apparatus | 115V 50/60Hz |
| **2037794** | Dual Corrosion Test Apparatus | 220-240V 50/60Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2036360** | Test Cell, borosilicate glass |
| **2035932** | Aluminum Test Specimen |

## Dual Extraction Apparatus

### Test Method
Determines lead, acid or salt content of crude petroleum and products by extraction.

### Features and Benefits
• Conforms to ASTM D2547, IP 77, 182, 248 and ISO 2083 specifications

### Dual Extraction Apparatus
Consists of two sets of glassware mounted on a sturdy base/upright assembly with separate line switches, rheostats and condenser water control valves for each. Each glassware set includes 500mL boiling flask, Hopkins reflux condenser with aspirator, thistle tube, heating tube, 250W heating coil and 400mL Pyrex™ beaker.

**Specifications**
Conforms to the specifications of:
ASTM D2547; IP 77, 182, 248; ISO 2083; NF M 07-014, 07-023
**Dimensions** lxwxh,in.(cm)
17x11x36.5 (43x28x93)
Net Weight: 46 lbs (21kg)
**Shipping Information**
Shipping Weight: 66 lbs (30kg)

| Ordering Information | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Electrical Requirements** |
| **2036226** | Dual Extraction Apparatus | 115V 50/60Hz |
| **2037337** | Dual Extraction Apparatus | 220-240V 50/60Hz |

## Conradson Carbon Residue Apparatus

### Test Method

Provides an indication of relative coke forming properties of petroleum oils. The residue remaining after a specified period of evaporation and pyrolysis is calculated as a percentage of the original sample

### Features and Benefits

• Conforms to ASTM D189 specifications

### Conradson Carbon Residue Apparatus

A weighed quantity of sample is placed in a crucible and heated to a high temperature for a fixed period. The crucible and the carbonaceous residue is cooled in a desiccator and weighed. The residue remaining is calculated as a percentage of the original sample and reported as conradson carbon residue.

**Specifications**

Conforms to the specifications of:
ASTM D189, D6074; ANS Z-11.25; IP 13; ISO 6615; DIN 51551; FTM 791-5001; NF T 60-116

**Included Accessories**

Porcelain Crucible
Skidmore Crucible, with
Monel Cover
Monel Crucible, with Cover
Monel Hood, with Bridge
Refractory Block

**Shipping Information**

Shipping Weight: 7 lbs (3.2kg)

| Ordering Information | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2035841** | Conradson Carbon Residue Apparatus |

| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2037009** | ASTM 8F Thermometer<br>Range: 30 to 760°F<br>Recommended for testing light distillate oils |
| **1394587** | ASTM 8C Thermometer, Range: –2 to +400°C |
| **1792320** | Porcelain Crucible |
| **1792319** | Skidmore Crucible, with Monel Cover |
| **1792317** | Monel Crucible, with cover |
| **1792318** | Monel Hood, with bridge |
| **2038194** | Refractory Block |

## Sediment Extraction Apparatus

### Test Method

Determines sediment content of crude oil and fuel oils by extraction with toluene

### Features and Benefits

• Conforms to ASTM D473 and related specifications

### Sediment Extraction Apparatus

A test portion of the sample is placed in a refractory thimble. Toluene is gently boiled and its vapors condensed and allowed to drip into the sample funnel. The toluene washes out all of the crude oil or fuel oil leaving the insoluble residue only in the thimble.

The mass of the residue is calculated as a percentage and is referred to as the sediment by extraction. Includes condenser thimble basket, water cup and extraction thimble.

**Specifications**

Conforms to the specifications of: ASTM D473; IP 53; ISO 3735; DIN 51789; FTM 791-3002; NF M 07-010

**Ordering Information**

| Catalog Number | Product Description |
|---|---|
| **1796278** | Sediment Extraction Apparatus |

**Accessories**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **1340238** | Powertrol Heater | 115V, 50/60Hz |
| **2035439** | Powertrol Heater | 220-240V, 50/60Hz |
| **2022075** | Condenser | |
| **1403441** | Thimble Basket | |
| **1403442** | Water Cup | |
| **2036470** | Extraction Thimble | |

## Humidity Cabinet for Testing Rust Protection

### Test Method

Tests the ability of metal preservatives to prevent steel panels from rusting under conditions of high humidity. Polished steel panels are immersed in the sample oil and then suspended in the humidity cabinet for a specified test period.

### Features and Benefits

• Conforms to ASTM D1748 and FTM 791-5310 specifications

### Humidity Cabinet for Testing Rust Protection

Produces a moisture saturated atmosphere with continuous condensation at a constant 120°F (48.9°C) for 33 steel test specimens. Test panels are suspended on a 1/3rpm rotating stage. Air flow and water level control systems maintain required conditions inside the cabinet per Mil. Spec.

and ASTM specifications. Air temperature is maintained at 120 ±2°F (48.9 ±1.1°C) by a digital LCD electronic controller. A continuous heater circuit assists the control heater in bringing the cabinet up to temperature prior to testing. Overtemperature protection is provided by an adjustable digital thermostat which cuts off power to the cabinet in case of overheating. Cabinet interior is stainless steel lined and all interior components are of stainless steel or chrome plated steel construction. Hinged cover consists of two layers of desized cotton cloth mounted on a metal frame. Oil and condensate dripping from the specimens are collected in a drip pan and piped to an external drain.

**Specifications**
Conforms to the specifications of:
ASTM D1748; FTM 791-5310
Capacity: 33 rust test specimens
Water Level Control: 8 in. (203mm)
Temperature Control Stability: ±2°F (± 1.1°C) (air temperature)
Heater Range: 0-1500W
Air Metering: 0.878±0.02832m3/h at standard temperature and pressure (31±1 ft3/h)

Air Distribution: 20-diffuser manifold
Rotating Stage: 1/3rpm

**Electrical Requirements**
115V 60Hz, Single Phase, 13.0A
220-240V 50Hz or 60Hz, Single Phase, 6.8A

**Included Accessories**
Monel Test Specimen Hooks (33 sets)

**Dimensions** lxwxh,in.(cm)
32x28x41.5 (81x71x105)
Net Weight: 206 lbs (93.4kg)

**Shipping Information**
Shipping Weight: 279 lbs (126.6kg)
Dimensions: 41 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2037287** | Humidity Cabinet | 115V 50/60Hz |
| **2036171** | Humidity Cabinet | 220-240V 50Hz |
| **2036669** | Humidity Cabinet | 220-240V 60Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2037732** | Steel Test Panels - Soft temper low carbon cold rolled steel, surface ground on both faces to a 10-20 micro-inch finish. 2x4x1/8"(51x102x3.2mm) |
| **2037793** | Aluminum Oxide Cloth, 240-grit for test panel preparation. Pack of 50. |
| **1793619** | ASTM 9F Thermometer, Range: 20 to 230°F |
| **2036580** | ASTM 9C Thermometer, Range: –5 to +110°C |

## Freezing Point Apparatus

### Test Method

Determines the freezing point of aqueous engine coolant solutions by cooling a sample with continuous agitation until a plateau is observed in a time-temperature curve.

### Features and Benefits

• Conforms to ASTM D1177 specifications

### Freezing Point Apparatus

Determines freezing points of aqueous engine coolants. Includes 200mL freezing tube with drilled cork, outer flask, motorized stirrer, clamps and stand. Similar to 1186706 Freezing Point Apparatus.

| Ordering Information | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Electrical Requirements** |
| **2038051** | Freezing Point Apparatus | 115V, 50/60Hz |
| **2037720** | Freezing Point Apparatus | 220-240V, 50Hz |
| **2037770** | Freezing Point Apparatus | 220-240V, 60Hz |

| Accessories | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Range** |
| **2037313** | ASTM 75F Thermometer | –35 to +35°F |
| **2035534** | ASTM 76F Thermometer | –65 to +5°F |

## Maleic & Phthalic Anhydride Purity Bath

### Test Method

Molten samples of maleic or phthalic anhydride are compared with Platinum-Cobalt color standards for determining sample purity and the qualitative stability in the presence of contaminants. High color content normally indicates contamination.

### Features and Benefits

- Conforms to ASTM D3366 specifications
- Redundant over-temperature protection circuitry
- Microprocessor-based temperature controller

### Maleic & Phthalic Anhydride Purity Bath

Electrically heated aluminum block features a microprocessor-based temperature controller with over- temperature protection circuitry and a dual LED temperature display. The heating unit provides temperature stability, heating rates, and minimal temperature gradients which exceed ASTM specifications, and is housed in an insulated steel cabinet with a chemically-resistant painted finish. Up to six samples can be tested at a time using Nessler tubes. Visual color comparisons are made against solutions of Platinum-Cobalt color standards or measured with a 1796545 Portable Automatic Colorimeter or a 2048569 Automatic Colorimeter.

**Specifications**

Conforms to the specifications of: ASTM D3366
Testing Capacity: 6 samples
Maximum Temperature: 260°C (500°F)
Temperature Control Stability: ±0.05°C (±0.1°F)

**Dimensions** lxwxh,in.(cm)
12x12x21 (31x31x54)
Net Weight: 65 lbs (30 kg)

**Shipping Information**
Shipping Weight: 76 lbs (35 kg)
Dimensions: 9 Cu. ft.

| Ordering Information | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Electrical Requirements** |
| **2059212** | Maleic & Phthalic Anhydride Purity Bath | 115V, 50/60Hz |
| **2059190** | Maleic & Phthalic Anhydride Purity Bath | 220-240V, 50/60Hz |

| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2059191** | Nessler Tubes |

## Thermometer Calibration Bath

### Features and Benefits

- Calibrates thermometers, temperature controllers and other tempera ture instruments against a factory certified thermometer traceable to NIST standards
- Verifies accuracy of routine thermometers
- For temperatures between ambient to 200°C (–30°C with the use of circulated refrigerated coolant)
- Digital temperature control with temperature uniformity of ±0.02°C
- Built-in ice bath for performing ice point calibrations
- Meets the requirements of NBS Monograph 150

### Thermometer Calibration Bath

Constant temperature calibration bath for liquid-in-glass thermometers, dial thermometers, digital thermometers and other temperature measuring instruments. Consists of an oil bath with digital electronic control providing temperature uniformity of ±0.02°C in the range –30°C to +200°C. Accessory Standard Thermometer is calibrated and certified traceable to NIST standards. Turntable rack inserts in bath to immerse six thermometers or temperature probes and the standard thermometer. Bath depth of 12" (30.5cm) accommodates all partial immersion thermometers and most 15" total immersion thermometers.
Features digital setpoint and display (°C/°F switchable) of bath temperature for maximum convenience, and over-temperature control to prevent accidental overheating. Built-in cooling coil permits circulation of tap water or refrigerated coolant to permit operation at sub-ambient temperatures or to facilitate rapid cool down for multi-point calibrations. Equipped with drains for oil bath and ice bath.

**Specifications**
Specifications
Temperature Range: –30°C to +200°C
For sub-ambient temperatures, refrigerated recirculating coolant is required from an external source.
Temperature Uniformity: ±0.02°C

Temperature Limit Control: –16.7°C (30°F) above setpoint and 204°C (400°F) maximum
Heater Range: 0-750W
Circulator: 1/20 hp impeller
Working Depth: Oil Bath: 12" (30.5cm)
Ice Bath: 10.5" (26.7cm)
**Electrical Requirements**
115V, 50/60Hz, Single Phase, 6.5A
220-240V, 50/60Hz, Single Phase, 3.3A
**Dimensions** lxwxh,in.(cm)
28x24x21 (71x61x53)
Net Weight: 52.75 lbs (23.9kg)
**Shipping Information**
Shipping Weight: 66 lbs (30kg)
Dimensions: 8.2 Cu. ft.

| Ordering Information | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Electrical Requirements** |
| **2037941** | Thermometer Calibration Bath | 115V, 50/60Hz |
| **2035199** | Thermometer Calibration Bath | 220-240V, 50/60Hz |

| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2035759** | Standard Thermometer, certified.<br>Traceable to NIST Standards at 0, 20, 37, 56, 80, 100, 121, 140, 160, 180 and 200°C. |
| **2035930** | Thermometer Carrying Case.<br>Holds 2035759 Standard Thermometer. |
| **2035465** | Thermometer Magnifier (10X) |

## General Purpose Utility Heater

### Features and Benefits

- For general laboratory applications
- Precise, reproducible settings
- 750 or 1250W nichrome heater option
- Accepts flat bottom and round bottom beakers and flasks

### General Purpose Utility Heater

Variable control electric heater designed for efficient, reproducible heating of flat bottom and round bottom beakers and flasks. Electronic unit control with reference dial permits fine temperature adjustment and accurate repeatable settings. Includes porcelain refractory heater with nichrome element (750 or 1250W) and refractory support plate that reverses to accept different size beakers and flasks. Polished stainless steel housing has cooling vents and two dovetail clamps to accommodate accessory support rod. Line switch and 6ft. (1.8m) three-conductor line cord and plug are included.

**Electrical Requirements**

115V 50/60Hz, 750 or 1250W
220-240V 50/60Hz, 750 or 1250W
**Dimensions** lxwxh,in.(cm)
5x5x10 (12.7x12.7x25.4)
Net Weight: 4.5 lbs (2.0kg)
**Shipping Information**
Shipping Weight: 8 lbs (3.6 kg)
Dimensions: 1.5 Cu. ft

| Ordering Information | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Electrical Requirements** |
| **1340238** | General Purpose Utility Heater | 115V 50/60Hz, 750W |
| **2038159** | General Purpose Utility Heater | 115V 50/60Hz, 1250W |
| **2035439** | General Purpose Utility Heater | 230V 50/60Hz, 750W |
| **2035392** | General Purpose Utility Heater | 230V 50/60Hz, 1250W |

# ASTM D3241- Thermal Oxidation Stability of Aviation Turbine Fuels

- **True Pour-n-Go Operation**
- **High Precision**
- **Improved Traceability**
- **Robust, Reliable and Compact**

ASTM D3241 Thermal Oxidation Stability of Aviation Turbine Fuels requires a strict conformance for the jet fuel industry for this critical test.

- Automatic aeration and fuel cleaning at the beginning of the test
- Priming is a snap with easy access and processor control
- Certified thermocouples guarantee accuracy without the need for calibration with lead.
- Maintenance Free Pump and Rugged Solenoid Valves
- Detailed On-Screen Reports and On-Board Result Database
- An optional certified differential pressure calibrator eliminates the traditional measuring and calculating to quickly verify, or recalibrate the ΔP without the use of fuel!

## Safety Features

- No more fumbling for fuses! It is protected with automatic thermal fuses. Visual Indicators immediately indicate which thermal fuse has been tripped minimizing instrument downtime and without a fuse inventory.
- Built-in, easily stored integral filter funnel holder reduces spills and drips for increased safety
- Automatic leak-detection and safety shutdown system
- Fume absorbing carbon filters

## Technical Data

| | |
|---|---|
| **Test Temperature** | 100 – 380°C |
| **Differential Pressure** | 0 – 300 mm Hg |
| **System Pressure** | 500 psi ± 50 psi |
| **Display** | Large, Color, Fuel-Resistant Touch screen |
| **Interfaces** | RS-232, USB (2). USB is compatible with keyboards, printers, barcode readers and USB-drives. |

## Operational Features

- Fast and Easy Operation
  - * Pour-and-Go operation
  - * Large, Color Touch Screen - fully protected against fuels and solvents
  - * Automatic Aeration
- Automatic Sample Introduction
  - * Less than 600 ml are needed
  - * Ideal for Field Applications, mobile Laboratories
- Save a specific temperature as your standard test temperature

| | |
|---|---|
| **Power** | 115V, 8A or 230V, 4 A, 47 - 63 Hz |
| **Dimensions** | 406 x 508 x 711 mm / 80 kg<br>16 x 20 x 28 in / 175 lbs |

## Consumables

| Catalog Number | Product Description |
|---|---|
| **2289028** | D3241 Heater Tube and Filter Kit, 12/pk |
| **1455831** | F400 Insulation Bushing Set (4 pcs) |
| **2295152** | Carbon Filters (5/pk) |
| **1718702** | F400 Tube O-Ring (25/bag) |
| **2289100** | F400 Pre-Filter O-ring |
| **1422314** | Box of Funnel Filters (100/box) |
| **1716187** | Box of Prefilters (25/box) |
| **1000768** | F400 Pre-filter screen |

| Ordering Information | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2289026** | Thermal Oxidation Tester, 115V |
| **2329732** | Thermal Oxidation Tester, 230V |

| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2289095** | D3241 Heater Tube and Filter Kit, 12/pk |
| **2044598** | F400 Insulation Bushing Set (4 pcs) |
| **2308175** | Carbon Filters (5/pk) |
| **2308170** | F400 Tube O-Ring (25/bag) |
| **2308171** | F400 Pre-Filter O-ring |
| **2295148** | Box of Funnel Filters (100/box) |
| **1455877** | Box of Prefilters (25/box) |
| **2308172** | F400 Pre-filter screen |

## Thermal Fouling Tester (FT2)

- **Full Data Acquisition Control**
- **Automatic Tube Temperature Profile**
- **Integrated Safety System**
- **Small and Compact**
- **Safe and Reliable**

The FT2 is the first instrument designed specifically for the SAE ARP 5996B Evaluation of Coking Propensity of Aviation Lubricants Using the Single Phase Flow Technique Test Method.
With the features that users have asked for, it's the ultimate in ease of use and fully flexible programmability. At the same time, the FT2 gives you convenient, flexible programming along with extensive,customizable safety and shutdown protocols. The FT2's enhanced hotspot determination and confirmation routines mean the FT2 should be a part of your critical turbine oil analysis laboratory!

### Heater Tube Materials - Packed 12 tubes/box.

| Part Number | Material |
|---|---|
| 2316985 | 316 Stainless Steel |

### Common Technical Data

| | |
|---|---|
| **Sample Capacity** | 1 L under system pressure |
| **Fluid Flow Rate** | 0.55 - 10 mL/min |
| **Test Duration** | 2.5 - 500 hours |
| **Power** | 120 or 230 VAC, 50/60 Hz |
| **Dimensions (HWD)** | 30 x 30 x 22 in, 175 lb<br>762 x 762 x 559 mm, 79.5 kg |
| **Interfaces** | USB, Ethernet |
| **Printer** | USB Printer recommended |

### SAE ARP 5996 System

**Temperature Range and Capabilities**

| | |
|---|---|
| **Heater Tube** | 300 - 450°C |
| **Reservoir** | 100 - 210°C |
| **Pressure** | 0 - 200 psi (1.38 MPa) |

### High Performance System

**Temperature Range and Capabilities**

| | |
|---|---|
| **Heater Tube** | 300 - 650°C |
| **Reservoir** | 100 - 210°C |
| **Pressure** | 0 - 1,000 psi (6.9 MPa) |

| Available Options and Spare Parts | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2316976** | Heated Test Supply/Return Lines Kit |
| **2316979** | Sight-Glass O-Ring Kit |
| **2316977** | Remote Emergency E-Stop |
| **2316978** | Pump Heater Jacket |
| **2316980** | Heater Tube Thermocouple |
| **2316981** | Inlet or Outlet Thermocouple |
| **2316982** | Line connection o-rings (25/pkg) |
| **2316983** | Replacement Reservoir Jacket |
| **2316984** | Replacement oven tube holder |

| Ordering Information | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2264719** | Per SAE ARP 5996B, 120 V, 50/60 Hz |
| **2316973** | Per SAE ARP 5996B, 230 V, 50/60 Hz |
| **2316975** | High Performance System, 120 V, 50/60 Hz |
| **2316974** | High Performance System, 230 V, 50/60 Hz |

## Pin & Vee Block Test Machine

### Used in Standard Test Methods

- ASTM Standards D2670, D2626, D3233, D5620
- Federal Test Methods FTM-791-3807.1, FTM-791-3812.1
- Chrysler Corporation 461-C-84-01, 461-C-84-02, 461-C-84-03
- Ford Motor Company FMC-BJ1-1
- Institute For Petroleum IP 241

### Suitable for Testing

- Fluid and Dry Lubricants
- Additive Packages and Base Stocks
- Dry Film Bonded Coatings
- Materials
- Hardface Coatings
- Metal Working Lubricants
- Refrigerant Lubricants

### General Information

The Pin & Vee Block Test Machine is a laboratory tool for evaluating wear, friction and extreme pressure properties of materials and lubricants.

The equipment rotates a 1/4 inch diameter test pin (journal) against two 1/2 inch diameter vee blocks. A four line contact region is established as load is applied through a mechanical gage by a ratchet wheel and an eccentric arm.

### Specifications And Features

**LOAD**:

Load is applied to the vee blocks against a rotating test pin by use of a ratchet wheel mechanism and spring type gage. The Dual Range Load

Gage applies from 200 to 3000 lbs direct load (4500 lbs reference load) ±2% full scale accuracy, up to 300 psi average initial Hertzian stress.

Optional low load gage (200 to 800 lbs) is available when improved accuracy at low loads is needed.

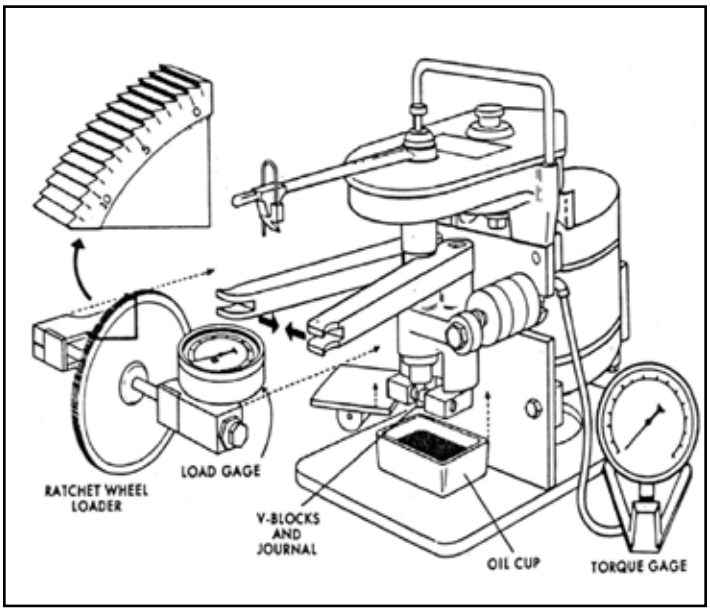
Electronic load systems provide digital display of 3000 lbs direct w load gage.

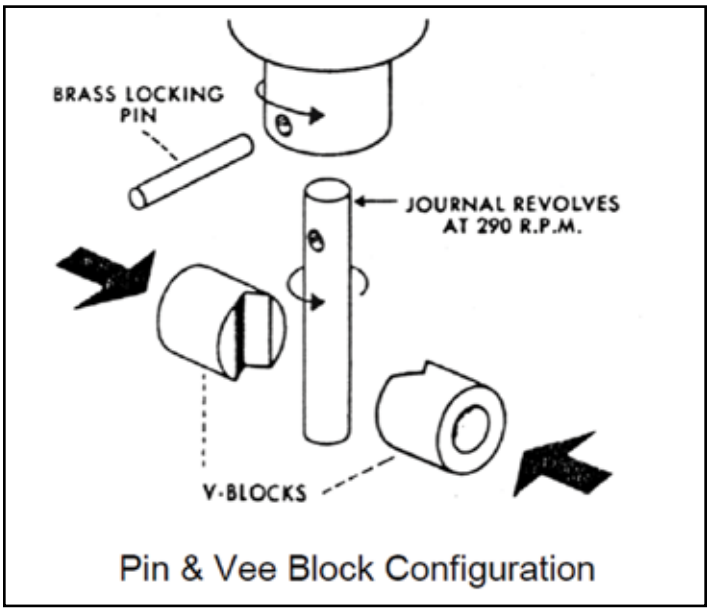
**SPEED:**

Shaft speed: 290 rpm ±10 rpm (18.98 ft/min)



Phone: 281-496-0900 sales@expotechusa.com www.expotechusa.com



Pin & Vee Block Configuration

**WEAR:**
Ratchet wheel system allows rate of wear measurement during test and total wear.
14.4 ratchet teeth = 0.001 inch (0.025 mm)

**TORQUE:**

0 to 100 in-lb load cell with digital display. Accuracy ± 2% full scale.

**ENVIRONMENT:**
Dry or lubricated

## System Description

### The Pin & Vee Block Test Machine is offered in two models:

#### 2255154 Pin & Vee Block Test Machine with 301 Test Data Acquisition System

System Includes Standard Pin and Vee Block Test Machine equipped with Digital Load Gage and Ratchet Wheel Assembly, Sample Fluid Cup, Manual Heater Control, Shear Pin Clip, Puller and Knock-out Tool, and PC Based Data Acquisition System. Requires optional PC Kit or customer supplied PC with Windows® XP Operating System)

### Options for 301 Test Data Acquisition System

#### 2283364 Digital Load Assembly for 301 Data System:

For use with the Data Acquisition System to display Test Load and Coefficient of Friction Values. Available with new units or as a kit for field installation on existing units.

#### 2283359 Digital Test Fluid Temperature Assembly for 301 Data System:

For use with the Data Acquisition System to display Test Fluid Temperature Values. Available with new units or as a kit for field installation on existing units.

#### 2255155 Pin & Vee Block Test Machine with Data Acquisition and Control System

System Includes Standard Pin and Vee Block Machine equipped with Digital Load Gage and Ratchet Wheel Assembly, Sample Fluid Cup, Heater Control, Shear Pin Clip, Puller, and Knock-out Tool, and PC Based Data Acquisition and Control System. (PC Kit Included)

### Options for Data Acquisition and Control System

#### 2255156 Automatic Loading Option:

Provides controlled maintenance of test load. User programmable test load and differential load point for the automatic maintenance of test loads. User defined and Standard Test Load Pro-grams for evaluating wear and extreme pressure properties of fluid lubricants and bonded solid lubricants. Load is applied in positive direction only. Option available with systems using the SoftWARE™ Data Acquisition Program. Available with new units or as a kit for field instal-lation on existing units.

#### 2255162 Wear Measurement Display:

For use with the F-1500C Pin & Vee Block Test Machine with Data Acquisition System to display wear as indicated in number of ratchet teeth or inches. Available with new units or as a kit for field installation on existing units.

## Pin & Vee Block Options & Accessories

### SoftWARE™ Data Acquisition System Upgrade:

For use with the standard Pin and Vee Block Test machines. Provides users of current machines to acquire and store friction, load, and temperature signals at user-selected predetermined time intervals. Data is presented in real time graphic and alpha numeric (spreadsheet) format compatible with Excel® and other commercial spreadsheet programs. Load displayed in Direct Load (150 to 3000 Lb) or Reference Load



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(200 to 4500 Lb) scales. Coefficient of friction and optional wear data are calculated and displayed simultaneously. Complete system with PC, SoftWARE™program, and electronic interface. F-1500AL Automatic Loading capability can be added for programmable control of loading.

**2255157 Dual Range Load Gage:**

Combines 3000 lb Direct Reading and 4500 lb Reference Reading Load Scales on a Single Gage

**2255163 High Pressure Test Chamber:**
Sealed chamber surrounding test area and fluid reservoir for performing evaluations of test oil saturated with refrigerant or other gases. Prevents gases from escaping continuously into atmosphere. Capable of initial temperatures from ambient room temperature to 150°C (302°F) and pressures from atmospheric to 225 psig. Pressure source not included.

**PLEASE NOTE:** This must be installed on a new Pin & Vee Block Test Machine by factory trained personnel; it cannot be field installed.

**2255174 High Precision Scar Measurement System:**
Binocular microscope with X-Y base and digital display of measurement accurate to 0.001 mm.

**2283360 Digital Scar Measurement System:**
Binocular microscope with CCD camera for on screen measurement to 0.01 mm.

**2255176 Load Calibration Kit:**
Includes one Brinell ball, back-up plug, support block and copper Brinell coupon.

**2255177 Copper Brinell Coupon:**
Used for checking calibration of load gage. BHN 37-39

**2255178 Electronic Load and Torque Calibration Assembly:**
System includes a high precision digital meter for displaying load and torque values and load cells and fixturing for calibration of test load and torque.

**2255179 Calibration Fluid Blend A:**
0.5 liter, 0.10% Sulfur Calibration Fluid per ASTM D2670

**2255180 Calibration Fluid Blend B:**
0.5 liter, 0.20% Sulfur Calibration Fluid per ASTM D2670

**2255182 Shear pin Clip and Puller:**
Clip holds shear pin secure during test and puller facilitates removal of clip.

**2255183 Shear pin Knock-Out Assembly:**
Shear Pin Removal Tool, facilitates safe extraction of brass hear pin from test machine shaft at end of test.

**2255184 Reaming Tool:**
Used to remove debris from inside test machine shaft at end of test.

## Pin & Vee Block Utilities & Dimensions

**Power requirements:**
220 V, 60 Cycle, Single Phase, 8 Amps (50 Cycle optional)

**Shipping information**
Model F-1500:
150 lbs (68 kg) 31 in x 31 in x 36 in (79 cm x 79 cm x 91 cm)
Model F-1500C:
242 lbs (110 kg) 43 in x 36 in x 42 in (109 cm x 91 cm x 190 cm)

**Space Requirements**
Bench top:
Model F-1500: 30 in x 24 in x 24 in (76 cm x 61 cm x 61 cm)
Models F-1500C: 60 in x 24 in x 24 in (152 cm x 61 cm x 61 cm)

## Test Specimens

These specimens conform to ASTM Standards: D 2670, D 2625, D 3233 and D 5620

**2255186 Complete Sets with #8 Test Pin:**
Two (2) Standard Vee Blocks (AISI 1137 Steel) , One (1) #8 Test Pin (SAE 3135 Steel), and One (1) Brass Shear Pin

**2255188 Complete Sets with #10 Test Pin:**
Two (2) Standard Vee Blocks (AISI 1137 Steel) , One (1) #10 Test Pin (SAE 3135 Steel), and One (1) Brass Shear Pin

**2255192 Standard Vee Blocks:**
AISI 1137 Steel, 96° block angle, Rc 20-24, 10 rms maximum

**2255194 Standard Vee Block with Thermocouple Hole**
AISI 1137 Steel, 96° block angle, Rc 20-24, 10 rms maximum

**2255197 Standard #8 Test Pin (journal):**
SAE 3135 steel, Rb 87-91, 10 rms maximum

**2255199 Standard #10 Test Pin (journal):**
SAE 3135 steel, Rb 100-104, 10 rms maximum

**2255200 Standard Shear Pins:**
1/2 hard yellow brass (ASTM spec. B-16) bag of 50

## For All of Your Lubricant and Materials Testing

### Lubricants

- Pin and Vee Block
- Block-on-Ring
- Timken EP
- Tapping Torque
- Panel Coker
- High Temperature/High Speed Bearing



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- Four Ball Wear
- Four Ball EP
- High Temperature Wheel Bearing
- Thermal Oxidation Stability (L60-1)
- Fretting Wear
- Hydrolytic Stability
- Grease Corrosion Test
- Isothermal Oxidation
- Hydraulic Fluid Pump Stand (Vickers and Conestoga)

### Fuels and Solvents

- Ball on Three Disk Fuel Lubricity
- Thin Film Evaporator
- Fuel Deposit Simulator

### Abrasion and Erosion

- Dry Sand/Rubber Wheel
- Air Jet Erosion
- Miller Number Slurry

### Materials

- Journal Bearing
- Multi-Specimen
- Crossed Cylinders
- Low Velocity Friction Apparatus
- Pin on Disk
- Coefficient of Stoption
- Magnetic Media and Paper Wear
- Life Performance Face Clutch System
- Thin Coating Wear (Electrical Contacts)
- Dual Drive Rolling Contact Fatigue
- High Speed Bearing/Mechanical Clutch

## Block-on-Ring Test Machine

The Block-on-Ring Test Machine combines test versatility with operational simplicity. Capable of simulating a variety of field conditions, the Block-on-Ring Test Machine evaluates the friction and wear characteristics of materials and lubricants in research, quality control, and technical service applications.

### Suitable for Testing

- Fluid Lubricants
- Greases
- Additive Packages and Base Stocks
- Dry Film Bonded Coatings
- Materials
- Hardface Coatings
- Refrigerant Lubricants
- Sliding Wear

### Used in Standard Test Methods

**ASTM D2714** - Calibration and Operation of the Block-on-Ring Friction and Wear Testing Machine

**ASTM D2981** - Wear Life of Solid Film Lubricants in Oscillation Motion

**ASTM D3704** - Wear Preventive Properties of Lubricating Greases Using the Block-on-Ring Test Machine in Oscillating Motion

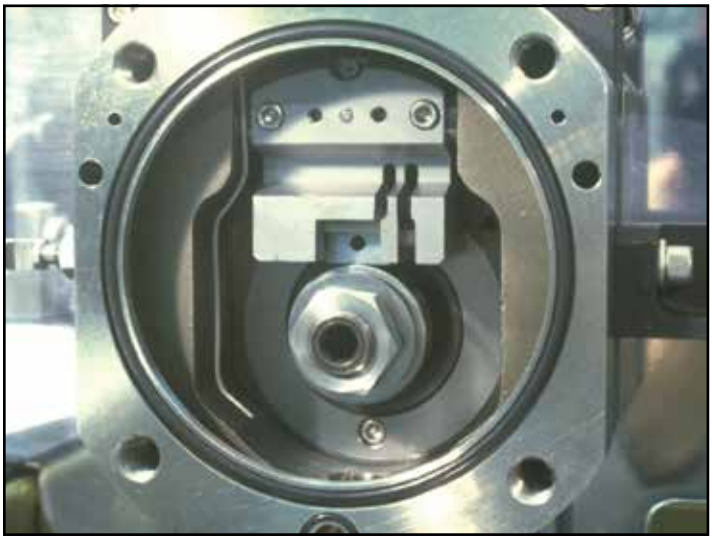
**ASTM D2509** - Extreme Pressure Properties of Lubricating Greases

**ASTM D2782** - Extreme Pressure Properties of Lubricating Fluids

**ASTM G77** - Ranking Resistance of Materials to Sliding Wear Using Block-on-Ring Wear Test

**Proposed STM** - Ranking Resistance of Polymeric Materials to Sliding Wear Using Block-on-Ring Wear Test

**Proposed STM** - Measuring Wear Properties of Dry Film Solid Lubricants Using a Block-on-Ring Machine in Unidirectional Motion



### Specifications And Features

**Speed And Velocity:**
Speed and Velocity control is managed by the operator selection of test shaft RPM and test specimen configuration. The Computer Control System enables programmable control of RPM set points, ramp rates, test parameter cycles, and test start sequences.

**Load:**
Load control is managed by the operator selection of test load and test specimen configuration. Computer Controlled Systems enable program mable control of Load set points, ramp rates, test parameter cycles, and-test start sequences using a Dual Range, Low 10 to 100 lbs. and High: 50 to 1300 lbs., Pneumatic Load System.

### Temperature Control:
Temperature control is managed through the operator selection of chamber and heater configuration, regulating environment or test specimen temperature. Computer Controlled Systems enable programmable control of Temperature set points, ramp rates, test parameter cycles, and test start sequences. Ambient to 250°C. External cooling options allow for sub-ambient testing environment temperatures.

### Environments:
The Block-on-Ring Test Machine is available with a Standard Enclosed Test Chamber, suitable for testing fluid lubricants, greases, coatings, or dry environment testing. An optional chamber seal kit allows for containment of atmospheres, purged or light vacuum environments, and pressurization to 150 psig max. Optional fluid lubricant recirculating systems and a grease feeder system are available.

### Test Duration:
Test Duration is controlled by elapsed time , number of test cycles, or through high-limit cutoff, set by Operator programmable control.

### Friction Force:
Friction Force is measured using an electronic load cell. The standard measuring system range is 0 to 250 lbs. An optional 0 to 25 lb. measuring system is available for lower range friction forces.

### Wear:
Continuous display of test specimen dimensional change indicating the rate of wear and/or total wear.

### Motion:
The Block-on-Ring is supplied with a standard unidirectional drive system. Computer Controlled Systems enable programmable control of an optional reversible drive system. Operator selection of oscillation range (5° to 720°) and test cycle patterns provide complete control of test motions.

### Utility Requirements:
220 VAC, Single Phase, 60 Hz. Optional 220 VAC, Single Phase 50 Hz Systems available. 80 psig clean, dry air supply required for operation of pneumatic loading systems.

### Weights And Dimensions:

Bench top - Complete System

| | |
|---|---|
| Space (L x W x H): | 72 x 24 x 30 in.<br>[1829 x 610 x 762 mm] |
| Estimated Weight: | 600 lbs [272 kg] |

Shipping

| | |
|---|---|
| Dimensions (L x W x H): | 48 x 48 x 48 in ea<br>[1220 x 1220 x 1220 mm] |
| Estimated Weight: | 600, 400, 300 lbs<br>[272, 182, 136 kg] |

**Test Geomteries**

| Contact Geometry | Test Adapter |
|---|---|
| **Line** | Block-on-Ring, Block-on-Ring, Canted Cylinder, Chip on Ring |
| **Area** | Conforming Block-on-Ring, Conforming Block-on-Ring |
| **Point** | Ball-on-Ring |

## Block On Ring Test Machine Software™

### For Test Program Creation, Parameter Control, Data Acquisition and Instrument Calibration

### System Descriptions

**2352564 Block On Ring Test Machine with SOFTWEAR™**

### Block On Ring Includes:
Variable Speed Servo Drive System
Friction Measurement System (High Range)
Standard Chamber & Cover
Style Test Spindle
Fluid Chamber Temperature Sensor
Specimen Temperature Sensor
Friction Sensor Calibration Fixture
Test (Dynamic) Wear Indicator (Dial Gage)
Pneumatic Test Load System (50 to 1300 lbf)
Test Chamber Drain Pan
Test Ring Locknut and Washer
Test Block Holder

### Software Includes:
Test Parameter Program Creation and Storage
Test RPM Display and Control
Test Temperature Display and Set Point Control
(Chamber or Test Specimen)
Test Load Display and Control (Pneumatic Load System)
Test Duration/Status Display and Control (Time and/or Cycles)
Programmable Parameter Loop Sequence
Test Data Acquisition and Data Storage
Test (Dynamic) Wear Display and Sensor
Real Time Data Graph
Manual Parameter Override
Fast Triggered Data Acquisition
PC Kit

### 2352565 Block On Ring Reversible Drive Option:
Control for Reversible Drive Servo Motor System



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**2352566 Block On Ring Chamber Seal Kit:**
Seal Kit for Test Spindle and Loading Assembly for elevated or reduced atmosphere testing

**2329579 Timken Size Test Adapter Assembly Option:** Test Block Holder and Test Shaft for operation with Timken Size Test Rings and Blocks

**2329581 Timken Test Oil Recirculation Option:** Oil Recirculation System for Testing per ASTM D2782

**2329582 Low Range Strain Gage Option:** Low Range Strain Gage (0 to 25 lbs) for improved Friction Force Measurement Sensitivity

**2329583 Size Dual Spray Nozzle Option:** Dual Spray
Nozzle for use with fluid recirculating system. Sprays fluid from opposite sides of the contact area during reversible motion tests.

**2329589 High Speed Pulley Options:**
Pulley and Timing Belt Assembly for High Speed Operation (7200 rpm max)

**2329591 See Through Cover For Pressure Chamber**

**2329593 Canted Cylinder On Ring Test Adapter**

## For All of Your Lubricant and Materials Testing

### Lubricants
- Pin and Vee Block
- Block-on-Ring
- Timken EP
- Tapping Torque
- Panel Coker
- High Temperature/High Speed Bearing
- Four Ball Wear
- Four Ball EP
- High Temperature Wheel Bearing
- Thermal Oxidation Stability (L60-1)
- Fretting Wear
- Hydrolytic Stability
- Grease Corrosion Test
- Isothermal Oxidation
- Hydraulic Fluid Pump Stand (Vickers and Conestoga)

### Fuels and Solvents
- Ball on Three Disk Fuel Lubricity
- Thin Film Evaporator
- Fuel Deposit Simulator

### Materials
- Journal Bearing
- Multi-Specimen
- Crossed Cylinders
- Low Velocity Friction Apparatus
- Pin on Disk
- Coefficient of Stoption
- Magnetic Media and Paper Wear
- Life Performance Face Clutch System
- Thin Coating Wear (Electrical Contacts)
- Dual Drive Rolling Contact Fatigue
- High Speed Bearing/Mechanical Clutch

## Scar Measurement Systems

**2246169 High Precision Scar Measurement System**
Includes binocular microscope with X-Y base and digital display of measurement accurate to 0.001 mm. System includes ball cup stand with single ball holder. Allows reading of ball scar without removal from ball cup.

**Block On Ring Accessories**

| Standard Test Specimens And Reference Materials | |
|---|---|
| **2329601** | Test Ring, S-25, SAE 4620, Rc 58-63, 22-28 rms. Conforms to ASTM D2981, D3704 and G77 |
| **2329603** | Test Ring, S-10, SAE 4620, Rc 58-63, 6-12 rms. Conforms to ASTM D2714, D3704 and G77 |
| **2329605** | Flat (HP) Test Block, H-30, SAE 01 tool steel, Rc 27-33, 4-8 rms. Conforms to ASTM D2714, D3704 and G77 |
| **2329607** | Flat (HP) Test Block, H-60, SAE 01 tool steel, Rc 58-63, 4-8 rms Conforms to ASTM D2981, D3704 and G77 |
| **2329608** | Calibration Fluid per ASTM D2714, 0.5 L |

## Timken Test Rig

The Timken Extreme Pressure Test Rig is one of the first commercially manufactured and most widely recognized testers for evaluating the load carrying capacity of extreme pressure lubricants. Originally developed in the 1930's by The Timken Company, this tester evaluates fluid lubricants and greases containing extreme-pressure additives.
The Timken Test Rig is supplied as a complete system to conduct ASTM Standard Test Methods D2509 and D2782.
Improvements include controlled rate test load and mechanical grease feeder systems, a test fluid recirculation system with temperature control, and an automatic fluid flow interrupter. Optional accessories include a variable speed motor and reservoir cooling system to improve versatility and performance.

## Standard Test Methods

**ASTM D 2509** - Standard Test Method for Measurement of Load-Carrying Capacity of Lubricating Grease (Timken Method)

**ASTM D 2782** - Standard Test Method for Measurement of Extreme-Pressure Properties of Lubricating Fluids (Timken Method)

## Specifications And Features

**Speed And Velocity:**
Variable Speed (850 rpm max), Unidirectional, 2 HP Motor with RPM Indicator.

**Load:**
Dead Weight Load applied through 10 : 1 Lever Arm.

**Maximum Test Pressure:**
Timken test block pressure (.022 in. scar width): 92,300 psi.

**Temperature Control:**
Digital Temperature Control for Test Fluid Circulating System (80° C max) Oil Reservoir Jacket for use with optional refrigerated system to cool test oil.

**Fluid Circulating System:**
3 liter reservoir with heater, oil pump and control valve.

**Automatic Grease Feeder:**
Electro/mechanical System to feed test grease at 45 ± 9 grams per minute.

**Automatic Loading Device:**
Pneumatic System to lower test weights at 2 to 3 lbs/sec

**Cabinetry:**
Heavy construction steel with electro/mechanical compartment, weight storage area, accessory drawer, and instrumentation panel.

**Wear:**
Measurement of scar width at specified load.

**Friction:**
Friction Lever System and weights (optional)

## System Description

**2352571 Timken Test Machine**

Standard Items include:
Timken Lubricant Test Machine (1750), 220 VAC, 60 Hz
Pneumatic Loading Device (2 to 3 lbs/sec) Air required
Load Lever Arm Assembly
Variable Drive Motor with RPM Indicator (850 rpm max)
Temperature Controller (80ºC max)
Oil Reservoir Jacket
Grease Feeder (45 ± 9 grams g/min)
Test Weights (114 lbs)
Test Cabinet

## System Options

**2352572 Inspection And Alignment Kit:**

For inspection and alignment of Timken Test Rig. Includes:
Dial Indicator (Shaft Run-out and Bearing End-play)

Magnetic Base (For use with Dial Indicator)
Insert Tool (Stud Insert to Shaft Taper)
Lever Level (Knife Edge to Shaft)
Digital RPM Indicator
Nozzle Tool (Nozzle to Shaft and Shaft Wear)
Tool Storage Case

**2352574 Friction Lever Group:**

Complete Friction Lever Assembly, including: Friction Lever and Sliding Weight, Friction Lever Block, Stud Insert, and Friction Lever Stop.

## Options And Accessories

**2346645 High Precision Scar Measurement System:**
Binocular microscope with X-Y base and digital micrometer. 0.001 mm display.

**2246169 Digital Scar Measurement System:**
Binocular microscope with CCD camera and SoftWARE™ for image capture and scar measurement. 0.001 mm display.

**2352573 Test Weight Set:**
Calibrated Weight Set for Test Load Application

**2352574 Friction Lever Group:**

Complete Friction Lever Assembly, Including: Friction Lever And Sliding Weight, Friction Lever Block, Stud Insert, And Friction Lever Stop.

**2352575 Load Lever Group:**
Complete Load Lever Assembly, Including: Load Lever, Load Lever Weight Hanger, Load Lever Spring, And Top And Bottom Load Lever Inserts.

**2352576 Load Lever Weight Hanger**

**2352577 Load Lever Spring**

**2275402 Friction Lever Block**

**2352578 Stud Insert (Knife Edge Support)**

**2352579 Friction Lever Stop**



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**2352580 Load Lever Insert (Knife Edge) - Top**

**2352581 Load Lever Insert (Knife Edge) - Bottom**

**2352594 Friction Lever Insert**

**2352595 Bushing, Test Shaft**

**2275404 Test Ring Lock-Nut**

**2352596 Spanner Wrench For Test Ring Lock-Nut**

**2352597 Control Valve Assembly**

**2352598 Timken Size Crescent Guide For Liquid Or Grease**

**2352599 Oil Splash Guard**

**2352600 Grease Splash Guard**

**2352601 Fluid Thermal Reservoir**

**2352602 Standalone Timken Air Loader**

**2352603 Standalone Timken Grease Feeder**

**2352604 Grease Feeder Tube**

**2352605 Grease Feeder End Cap (Top)**

**2352606 Spanner Wrench For Grease Feeder**

## Test Specimens

**2275406 Timken Test Block**

(formerly F-45349 or F-25001) Conforms to ASTM D 2782 and D 2509
Box of 10 Blocks
Carburized Steel, 58 to 62 HRC, four ground test surfaces
0.485 ± 0.002 in. wide and 0.750 ± 0.016 in. long, 20 to 30 µin.

**2291400 Timken Test Ring (Cup)**

(formerly F-48651 or F-25061) Conforms to ASTM D 2782 and D 2509
Box of 25 Rings
Carburized Steel, 58 to 62 HRC, axial surface roughness 20 to 30 µin.
0.514 ± 0.002 in. wide and 1.938 + 0.001, - 0.005 in. diameter, maximum radial run-out of 0.0005 in.
Test consumable pieces are available in a wide range of materials, surface finishes, and hardness, or from user supplied material. Please contact your EXPOTECH USA Representative for price and availability.

## For All of Your Lubricant and Materials Testing

### Lubricants

- Pin and Vee Block
- Block-on-Ring
- Timken EP
- Tapping Torque
- Panel Coker
- High Temperature/High Speed Bearing
- Four Ball Wear
- Four Ball EP
- High Temperature Wheel Bearing
- Thermal Oxidation Stability (L60-1)
- Fretting Wear
- Hydrolytic Stability
- Grease Corrosion Test
- Isothermal Oxidation
- Hydraulic Fluid Pump Stand (Vickers and Conestoga)

### Fuels and Solvents

- Ball on Three Disk Fuel Lubricity
- Thin Film Evaporator
- Fuel Deposit Simulator

### Materials

- Journal Bearing
- Multi-Specimen
- Crossed Cylinders
- Low Velocity Friction Apparatus
- Pin on Disk
- Coefficient of Stoption
- Magnetic Media and Paper Wear
- Life Performance Face Clutch System
- Thin Coating Wear (Electrical Contacts)
- Dual Drive Rolling Contact Fatigue
- High Speed Bearing/Mechanical Clutch

### Abrasion and Erosion

- Dry Sand/Rubber Wheel
- Air Jet Erosion
- Miller Number Slurry

## Multi Specimen Test Machine

The MultiSpecimen Test Machine is a versatile system for evaluating the friction, wear, and abrasion characteristics of materials, coatings, and lubricants. The MultiSpecimen Test Machine will perform numerous Standard Test Methods and Application Specific Custom testing programs
User selected contact geometries, motions, velocities, temperatures, and contact pressures, and test specimen materials allow one test apparatus to meet many commercial and military test specifications and simulate a broad range of field applications.
Applications for the MultiSpecimen include research and development, quality control, product qualification and the evaluation of physical and performance characteristics of materials, coatings, and lubricants.

Test studies and a number of technical publications confirm exceptional correlation with field service.

## Features And Specifications

### Drive System

Computer controlled servo motor configured for 220 V, Single Phase, 50 or 60 cycle operation.

The motor drives the upper vertical shaft. The lower vertical shaft is held stationary by the Torque Measurement System. Standard speed range is 30 to 3600 rpm. Optional pulley configurations are available for speed ranges 15 to 1800 rpm and 60 to 7200 rpm.

An optional rotational speed reducer is available for the operation of Stick/Slip and Static Torque and COF determinations. Programmable speed control to as low as 0.01 rpm.

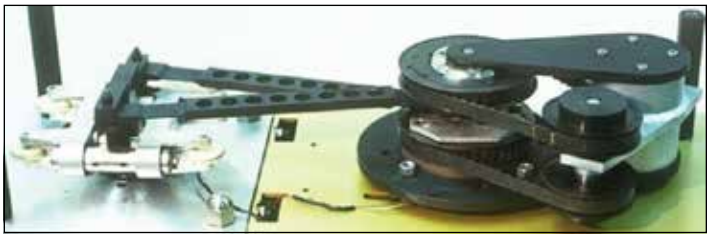
The optional Reversible Drive SoftWare™ provides Oscillatory Motion Control from 2° to 720° (angle of motion dependent on test speeds and loads).

| Degrees of Oscillation | Cycles per Minute, max |
|---|---|
| 720° | 150 |
| 5° | 1150 |
| 2° | 1600 |

Mechanical Oscillating Drive Systems are also available in standard and high-speed versions enabling simulation of start/stop motion. Maximum oscillation is 90° (angle of motion dependent on test speeds and loads).

### Test Load

**Programmable MultiSpecimen:** Automated Test Load Control System eliminates the use of test weights. User defined parameters for test load ramping rates, soaking times, and test cycle control. Dual Range Pneumatic System for applied test load ranges of 50 to 800 lbs. and 10 to 60 lbs. Optional ultra low load ranges are available upon request.



| Degrees of Oscillation | Cycles per Minute, max |
|---|---|
| 0° - 20° | 1500 |
| 21° - 30° | 1200 |
| 31° - 40° | 1100 |
| 41° - 50° | 900 |
| 51° - 70° | 600 |
| 71° - 90° | 500 |

**Semi-Automated MultiSpecimen:** Manual Test Load System: Test Load is applied using a Dual Range Mechanical Lever (2:1 or 10:1 ratio) and Dead Weights. Maximum Bale Weight is 80 lbs. The 2:1 lever ratio applies loads from 1 lb. to 160 lbs. The 10:1 lever ratio applies loads from 20 lbs. to 800 lbs.

### Environments

Standard Systems provide fluid and test specimen initial temperature set point (ambient to 150°C) using liquid or dry environments.

Optional Systems for temperature regulation (-30°C to 200°C), humidity measurement and/or control, and test fluid recirculation.

### Temperature Control

**Programmable MultiSpecimen:** Automated Test Temperature System with computer control. User defined parameters for test temperature ramping rates, soaking times, and test cycle control. Standard Systems provide test table heaters (ambient to 150°C) for liquid and dry test environments. User programmable test alarms and abort levels.

**Semi-Automated MultiSpecimen:** User defined test temperature set point and ramp rate. Standard Systems provide test table heaters (ambient to 150°C) for liquid and dry test environments. User programmable test alarms and abort levels.
Optional Systems increase the temperature set point and regulation (-30°C to 200°C). Heater Cups and Heated and/or cooling recirculating systems increase the flexibility of temperature control and regulation for liquid and dry environments.

### Friction Measurement

The lower shaft transmits a signal through a load cell for determining torque. The Standard System includes a 0 to 100 lb Load Cell. The SoftWARE™ records and displays the test torque data and calculates a real-time Coefficient of Friction. User programmable test alarms and abort levels.

### Wear Measurement

**Programmable MultiSpecimen:** Dynamic Digital Wear Measurement System records and displays the real-time test system wear displacement. User programmable test alarms and abort levels.

**Semi-Automated MultiSpecimen:** Standard System includes a dial gage indicator for test system wear displacement. An Optional Dynamic Wear Measurement System is available for the Semi-Automated MultiSpecimen.

### Test Duration

Standard Systems include user defined alarms and abort levels for test time (H:MM:SS) and test cycles (shaft revolutions).

### Utility Requirements

Power: 220 Volts, 60 cycle or optional 50 cycle, single phase.
Pneumatics: 80 psig clean, dry air required for pneumatic load systems.

### Space Requirements

Bench-top: 72 in. (L) x 28 in. (D) x 36 in. (H) 2 m (L) x 0.7 m (D) x 1 m (H)

### Standard Test Methods

**ASTM D3702** Standard Test for Wear Rate and Coefficient of Friction in Self-Lubricated Rubbing Contact Using a Thrust washer Testing Machine

**ASTM D2266** Standard Test Method for Wear Preventive Characteristics of Lubricating Grease (Four Ball Method)



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**ASTM D4172** Standard Test Method for Wear Preventive Characteristics of Lubricating Fluids (Four Ball Method)

**ASTM D5183** Standard Test Method for Coefficient of Friction Using a Four Ball Wear Test Machine

**ASTM G99** Standard Test Method for Wear Testing with a Pin on Disk Apparatus

**Proposed** Standard Test Method for Predicting Coefficient of Friction and Wear Properties of Hydraulic Fluids Using a Cyclic Stress Vane Apparatus

## Multispecimen Test Machine With Automated Software™ Data Acquisition And Control

Fully Automated Test System with Pneumatic Loading System and Test Program Creation, Control, and Data Acquisition

Standard System includes the Automated Test Load Control System, Programmable Varialble Speed Motor, Automated Temperature Control System, Friction Measurement System, Wear Measurement System, Torque Calibrator, Table Heater Assembly, Oil Reservoir Cup, Chamber Cooling Fan, and Standard Test Specimen Table.

### Test Parameter Control

Test Program Creation and Control Software
Test RPM Control
Test Temperature Set Point Control
(Chamber or Test Specimen)
Test Load Set Point and Control
Test Duration Control (Time and/or Cycles
Programmable Parameter Loop Configuration
Test Program Pause System
Test Program Manual Override

### Test Data Acquisition

Test Data Acquisition and Data Storage
Test RPM Indicator
Test Temperature Indicators
(Chamber and Test Specimen)
Test Load Indicator
Test Wear Indicator
Test Duration Indicators (Time and Cycles)
User Defined Fast Data Acquisition Trigger
User Defined Real Time Data Graph

## Multispecimen Test Machine With Software™ Data Acquisition

Semi-Automated Test System with Mechanical Loading System and Test Parameter Control.

Standard System includes the Mechanical Dead Weight Load System, Varialble Speed Motor, Temperature Control System, Friction Measurement System, Dial Indicator Wear Gage, Torque Calibrator, Table Heater Assembly, Oil Reservoir Cup, Chamber Cooling Fan, and Standard Test Specimen Table. Optional Test Load Indicator and Digital Wear Indicator are available.

### Test Parameter Control

Test Parameter Control Software
Test RPM Control
Test Temperature Set Point Control
(Chamber or Test Specimen)
Test Load Set Point
Test Duration Control (Time and/or Cycles)

### Test Data Acquisition

Test Data Acquisition and Data Storage
Test RPM Indicator Test
Temperature Indicators
(Chamber and Test Specimen)
Test Load Indicator (optional)
Test Wear Indicator (optional)
Test Duration Indicators (Time and Cycles)

| Available Test Adapter Configurations | | | |
|---|---|---|---|
| Four Ball Wear | Oscillating Roll/Slide | Thrust Washer | Rolling Four Ball |
| Gear/Cam Contact | Three Pad on Disk | Ball on Flat | Pin on Disk |
| Ball Bearing | Powder Friction | Slurry Erosion | Three Balls on Flat |
| Three Pin on Disk | Sheet Abrasion | Three Ball Microfilm | Sliding Bottle |
| Walking Cam | Ball on Three Disk | Shear Stability | O-Ring Wear |
| Face Seal | Pump Rotor Vane | Roller Bearing | Hypoid Gear |
| Lip Seal | Thrust Bearing | Impact | Piston Ring Test |
| Cyclic Stress Pump Rotor Vane | Viscous Drag Friction | Timing Belt Friction and Wear | Stick-Slip / Static COF |

| Options And Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2297315** | DYNAMIC DIGITAL WEAR SENSOR FOR 2297312<br>Optional Digital Wear Sensor and Display System for 310 SoftWARE™ |
| **2297368** | DIGITAL LOAD SENSOR FOR 2297312<br>Optional Digital Load Sensor and Display System for 310 SoftWARE™ |
| **2297347** | TEST VIBRATION SENSOR SYSTEM FOR SOFTWARE™ SYSTEMS<br>Optional Vibration Sensor and Display System for 310 and 330 SoftWARE™ |
| **2297369** | TEST CHAMBER HUMIDITY SENSOR FOR SOFTWARE™ SYSTEMS<br>Optional Humidity Sensor and Display System for 310 and 330 SoftWARE™ |
| **2297345** | LOW SPEED MECHANICAL OSCILLAITING DRIVE SYSTEM<br>Optional System for low speed oscillatory tests (90° max angle, 600 max rpm)<br>*for use with older versions of the MultiSpecmen Test Machine |
| **2297362** | MECHANICAL OSCILLAITING DRIVE SYSTEM<br>Optional System for oscillatory tests (90° max angle, max rpm dependent on angle of oscillation)<br>*for use with older versions of the MultiSpecmen Test Machine |
| **2297395** | REVERSIBLE DRIVE SYSTEM<br>Optional System for oscillatory tests (720° max angle, max rpm dependent on angle of oscillation) |
| **2297354** | HEATED RESERVOIR TEST CUP<br>Optional Heated Test Cup for liquid and dry test (200°C max) |
| **2297313** | LOAD CALIBRATION SYSTEM FOR 330 SOFTWARE™ SYSTEM<br>Digital Meter and Load Cell Assembly for Test Load Calibration of Pneumatic Load System |
| **2297361** | CONVECTIVE AIR COOLING TEST RESERVOIR WITH COVERS<br>Test Reservoir Assembly with increase surface area to improve air cooling |
| **2297331** | STANDARD 100 ML TEST RESERVOIR WITH COVERS |
| **2297310** | 25 ML TEST RESERVOIR WITH COVERS |
| 2297382 | LOW TEMPERATURE CHAMBER (DRY ICE) |
| **2297323** | LOW TEMPERATURE CHAMBER (FOR USE WITH COOLER) |
| **2297383** | LOW TEMPERATURE RECIRCULATING CHILLER (-30°C) |
| **2297381** | LOW RANGE LOAD CELL FOR TORQUE MEASUREMENT SYSTEM (0 TO 10 LBS) |
| **2297348** | TEST FLUID RECIRCULATION SYSTEM (150°C MAX) |
| **2297360** | HUMIDITY CONTROL SYSTEM (30 TO 60% RH) |
| **Scar Measurement Systems** | |
| **2284090** | SCAR MEASUREMENT SYSTEM<br>Binocular microscope with scaled eyepiece and light. Ball cup stand and single ball holder.<br>Allows reading of ball scar without removal from ball cup. |
| **2246168** | HIGH PRECISION SCAR MEASUREMENT SYSTEM<br>Includes binocular microscope with X-Y base and digital display of measurement accurate to 0.001 mm. System includes ball cup stand with single ball holder.<br>Allows reading of ball scar without removal from ball cup. |
| **2284091** | DIGITAL SCAR MEASUREMENT SYSTEM with CCD CAMERA<br>Includes a CCD camera and digital display of ball scar and capability of measurement on screen to 0.01 mm. System includes ball cup stand with single ball holder and CCD camera with USB port for recording scar diameters to computerized data acquisition system or host computer.<br>Allows for reading ball scar without removal from ball cup. |

| Options And Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2297373** | FOUR BALL WEAR TEST ADAPTER |
| **2297307** | METRIC WEIGHT SET |
| **2297387** | THREE DISK HOLDER (FOUR BALL CONFIGURATION) |
| **2297319** | BALL ON THREE DISK (BOTD) TEST ADAPTER |
| **2297341** | B.O.T.D. ACCESSORY KIT |
| **2297393** | B.O.T.D. TEST WEIGHT SET |
| **2284085** | DISK FIXTURE |
| **2284079** | ROLLING FOUR BALL SPECIMEN RACE |
| **2297317** | COLLET ASSEMBLY |
| **2297371** | GEAR LUBRICANT TEST ASSEMBLY |
| **2297326** | ROLLER PLATE AND PIN ASSEMBLY (FOR 2297371) |
| **2297320** | WALKING CAM LUBRICANT TEST ASSEMBLY |
| **2297316** | ROLLER PLATE AND PIN ASSEMBLY (FOR 2297320) |
| **2297370** | ROLLER SPECIMEN DRIVER (FOR 2297371 AND 2297320) |
| **2297334** | PUMP ROTOR VANE |
| **2297374** | STICK-SLIP TEST ASSEMBLY |
| **2297389** | THRUST WASHER, SMALL |
| **2297335** | THRUST WASHER, LARGE |
| 2297308 | SPECIAL SMALL THRUST WASHER CLAMPING SYSTEM |
| 2297309 | SPECIAL LARGE THRUST WASHER CLAMP |
| 2297355 | SINGLE PIN-ON-DISK TEST ADAPTER |
| 2297372 | THREE PIN-ON-DISK TEST ADAPTER |
| 2297328 | SINGLE BALL-ON-DISK |
| 2297337 | SINGLE BALL-ON-DISK, VAMAS STYLE ADAPTER |
| 2297336 | THREE BALL-ON-DISK TEST ADAPTER, SMALL |
| 2297356 | THREE BALL-ON-DISK TEST ADAPTER, LARGE |
| 2297392 | LIQUID EROSION TEST ASSEMBLY |
| 2297391 | FACE SEAL TEST ADAPTER |
| 2297390 | LIP SEAL TEST ADAPTER |
| 2297342 | THREE BALL MICRO FILM TEST ADAPTER |
| 2297330 | UPPER AND LOWER DISK SET |
| 2297357 | O-RING WEAR TEST ADAPTER |
| 2297375 | OSCILLATING ROLL/SLIDE ADAPTER |
| 2297321 | SHEAR STABILITY OF FLUIDS ADAPTER |
| 2297338 | BALL BEARING TEST ASSEMBLY |
| 2297371 | HYPOID GEAR TEST ASSEMBLY |
| 2297378 | UPPER RACE SPECIMEN |
| 2297358 | LOWER RACE SPECIMEN |
| 2297377 | ROLLER SPECIMEN |
| **2297329** | TIMING BELT TEST ADAPTER |
| **2297338** | BALL BEARING TEST ADAPTER |
| **2297327** | VISCOUS DRAG FRICTION TEST ADAPTER |
| **2297379** | IMPACT TEST OCTAGONAL SPECIMEN, 1018 STEEL |

**Hypoid Gear Test Assembly**

**Three Pad on Disk Test**

| Options And Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2297352** | IMPACT TEST ROLLER SPECIMEN, 440C STAINLESS STEEL |
| **2297318** | PLASTIC POWDER FRICTION AND WEAR TEST |
| **2297384** | SPECIMEN RING |
| **2297350** | SHEET ABRASION TEST ADAPTER |
| **2297332** | SHEET METAL DRAWING AND FORMING ADAPTER |
| **2297394** | SLIDING BOTTLE TEST ADAPTER |
| **2297344** | POWDER FRICTION TEST ASSEMBLY |
| **6105079** | LINING PLATE SPECIMEN HOLDER ASSEMBLY |
| **Standard Specimens - Thrust Washer Configuration** | |
| **2297322** | Small Rotating Upper Specimen 1018 Steel, Rc 15-25, 14-18 rms |
| **2297346** | Large Rotating Upper Specimen 1018 Steel, Rc 15-25, 14-18 rms |
| **2297339** | Small Stationary Lower Specimen 1018 Steel, Rc 15-25, 14-18 rms |
| **2297351** | Large Stationary Lower Specimen 1018 Steel, Rc 15-25, 14-18 rms |
| **Standard Specimens - Four Ball Configuration** | |
| **2246165** | Test Specimen Balls |
| **2297349** | Ball-On-Three-Disks (BOTD) Specimen Set |
| **Standard Specimens - Pin-On-Disk Configuration** | |
| **2297359** | Upper Rotating Pins 440C Stainless Steel, Rc 55-58 |
| **Standard Specimens - Vane Pump Configuration** | |
| **2297385** | Upper Rotating Vanes<br>(3 per Test) M-2 Steel, Rc 58-62, 6-12 rms, 0.590 in. radius |
| **2297366** | High Stress Upper Rotating Vanes<br>(3 per test) M-2 Steel, Rc 58-62, 6-12 rms, 0.250 in. radius |
| **2297353** | Stationary Lower Specimen<br>52100 Steel, Rc 58-62, 9-15 rms |
| **2297367** | Cyclic Stress Lower Specimen<br>52100 Steel, Rc 60-63, 9-15 rms |
| **Standard Specimens - Gear/Cam And Walking Cam Test Configuration** | |
| **2297380** | Upper Specimen Rollers (2 per Test) 8620 Steel, Rc 55-58, 24-30 rms |
| **2297325** | Upper Specimen Rollers (2 per Test) 8620 Steel, Rc 50-54, 24-30 rms |
| **2297396** | Lower Specimen Gear 8620 Steel, Rc 55-58, 24-30 rms |
| **2297376** | Lower Specimen Walking Cam 400 C Stainless Steel, Rc 55-58, 24-30 rms |
| **Standard Specimens - Oscillating Roll/Slide** | |
| **2297375** | Test Specimen Inserts<br>(4 Required per Test) 440C Stainless Steel, Rc 55-58, 14-18 rms. |

## For All of Your Lubricant and Materials Testing

### Lubricants

- Pin and Vee Block
- Block-on-Ring
- Timken EP
- Tapping Torque
- Panel Coker
- High Temperature/High Speed Bearing
- Four Ball Wear
- Four Ball EP
- High Temperature Wheel Bearing
- Thermal Oxidation Stability (L60-1)
- Fretting Wear

- Hydrolytic Stability
- Grease Corrosion Test
- Isothermal Oxidation
- Hydraulic Fluid Pump Stand (Vickers and Conestoga)

### Fuels and Solvents

- Ball on Three Disk Fuel Lubricity
- Thin Film Evaporator
- Fuel Deposit Simulator

### Materials

- Journal Bearing
- Multi-Specimen
- Crossed Cylinders
- Low Velocity Friction Apparatus
- Pin on Disk
- Coefficient of Stoption
- Magnetic Media and Paper Wear
- Life Performance Face Clutch System
- Thin Coating Wear (Electrical Contacts)
- Dual Drive Rolling Contact Fatigue
- High Speed Bearing/Mechanical Clutch

### Abrasion and Erosion

- Dry Sand/Rubber Wheel
- Air Jet Erosion
- Miller Number Slurry

## Four-Ball Extreme Pressure Test Machine

The Four-Ball EP Test measures a lubricant's extreme pressure properties under High Hertzian contact in pure sliding, or pure rolling, motion. The test is used to determine the load carrying properties of a lubricant at high test loads.

Three determinations are made:
Load-Wear Index (LWI)
Last Non-Seizure Load (LNSL)
Weld Point (WP).

The Four-Ball EP Test rotates a ½-inch diameter ball in contact with three similar balls held stationary in the test cup. The contact surfaces are covered with test lubricant, a load is applied and a timed test is performed. Normally, the wear scars on the three lower balls are measured and averaged. The test is generally terminated at the load where the rotating ball 'welds' to the three stationary balls.

The Load-Wear Index (LWI) quantifies the wear protection at increasing loads. The Last Non-Seizure Load (LNSL) indicates the transition from elastohydrodynamic to boundary lubrication and metal to metal contact.

The Four-Ball EP is available in two configurations:

**Standard System**, suitable for the ASTM and IP Standard Test Methods for Four Ball EP Testing

**High Performance System with Data Acquisition:** for ASTM and IP Standard Test Methods for Four Ball EP Testing Optional Accessory Kits for Four Ball Wear Testing (ASTM D2266 and D4172) and Shear Stability Determinations (KRL Method)

The CEC L-45-A-99 (KRL) Test Method determines the shear stability of polymer-containing lubricating oils by the Four-Ball tester using a tapered roller bearing. The test results allow prediction of in-service permanent viscosity loss.

**Tribology and Petroleum Testing Equipment for More Than 80 Years**

### Four-Ball Ep Features And Specifications

**LOAD**
1000 kg max, applied using a lever arm and dead weight loading system

**SPEED**
1760 rpm Standard 100 to 1800 rpm with optional High Performance Upgrade

**MOTION**
Sliding Rolling (with optional rolling 4 ball race)

**TORQUE**
Measure and record test torque with optional High Performance Upgrade

**TEMPERATURE**
Controlled and recorded from ambient to 200°C with optional High Performance Upgrade

**SPACE REQUIREMENTS**
72 x 60 x 65 in [L x D x H]  183 x 152 x 165 cm

**POWER**
220 Volts, 60 Hz, Single Phase, 15 Amps. 50 Hz optional

**SHIPPING INFORMATION**
900 lb / 408 kg
56 x 36 x 65 in / 142 x 91 x 165 cm [L x W x H]

### Standard Test Methods

**ASTM D2596:** Standard Test Method for Measurement of Extreme-Pressure Properties of Lubricating Grease (Four-Ball Method)

**ASTM D2783:** Standard Test Method for Measurement of Extreme-Pressure Properties of Lubricating Fluids (Four-Ball Method)

**ASTM D2266:** Standard Test Method for Wear Preventive Characteristics of Lubricating Grease (Four Ball Method)

**ASTM D4172:** Standard Test Method for Wear Preventive Characteristics of Lubricating Fluid (Four Ball Method)

**CEC L-45-A-99**: Viscosity Shear Stability of Transmission Lubricants (Taper Roller Bearing Rig)

**IP 239:** Determination of Extreme Pressure and Anti-wear Properties of Lubricants - Four Ball Machine Method

IP 300 (obsolete) Rolling Contact Fatigue Test for Fluids in a Modified Four-Ball Machine

**DIN 51350-1:** Testing of lubricants; testing in the Shell-four-ball tester, general working principles

**DIN 51350-2:** Testing of lubricants; testing in the Shell-four-ball tester, determination of welding load of fluid lubricants

**DIN 51350-4:** Testing of lubricants; testing by the Shell four-ball tester; determination of welding load of consistent lubricants

**DIN 51350-6:** Determination of shear stability of polymer-containing lubricating oils by the Shell Four-Ball tester

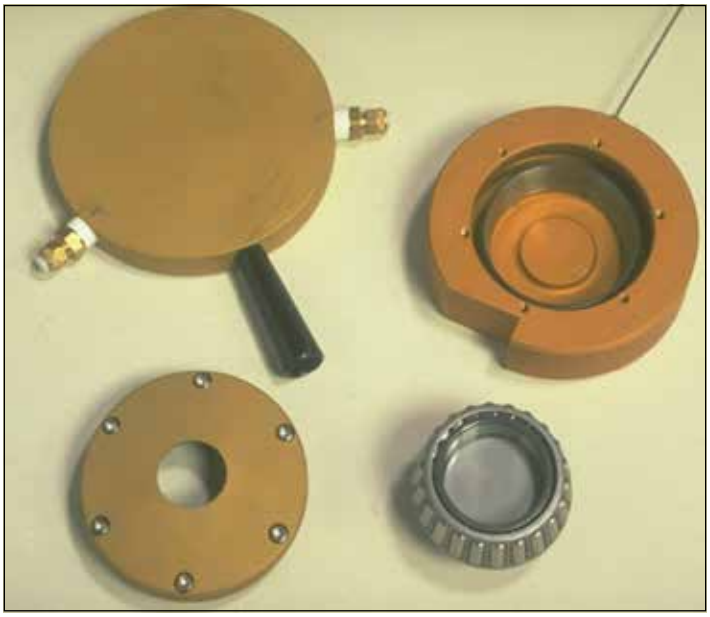
## Four-Ball Ep Components And Options

**2346636** **FOUR-BALL EXTREME PRESSURE TEST MACHINE**

- Two Speed Motor and Test Spindle
- Dead Weight Load System and Weights
- Digital Timer and Test Shut-off
- Ball Cup Assembly
- Test Stand
- Test Cup Table Fixture
- Torque Wrench
- Upper Ball Chuck

**2326119** **HIGH PERFORMANCE FOUR-BALL EXTREME PRESSURE TEST MACHINE with DATA ACQUISITION**

***TORQUE MEASUREMENT***
Test Torque Load Cell Assembly, Torque and Coefficient of Friction Display and Data Acquisition



***TEMPERATURE CONTROL***
Ball Cup Heater Assembly, Display and Data Acquisition Automatic Temperature Start-Up, Maximum Temperature 200° C.

***VARIABLE DRIVE MOTOR***
Variable Speed Motor Assembly, Display and Data Acquisition Maximum spindle speed 1800 rpm

**2288912** **FOUR BALL WEAR TESTING KIT**
Accessories for Wear Testing using ASTM D2266 or D4172 Test Parameters. Includes precision test load assembly and Wear Test Cup

### Options And Accessories

| Catalog Number | Product Description |
|---|---|
| **2346641** | **BALL CUP ASSEMBLY**<br>Ball Cup (2346643) - 1 , Ball Cup Nut (2346644) - 2<br>Ball Clamp Ring (2288920) - 3, Cup Disk (2288919) - 4 |
| **2288913** | **BALL CUP ASSEMBLY with THERMOCOUPLE**<br>Ball Cup (2346643), Ball Cup Nut (2346644)<br>Ball Clamp Ring (2288920, Cup Disk 2288919), Thermocouple (F-1518-8) - not shown |
| **2255742** | **#28 BALL CHUCK** - 5<br>Holds upper rotating ½ inch diameter ball during testing |
| **2284085** | **DISC FIXTURE**<br>For punching ¼" diameter disc from 1/16" sheet stock (must be used with arbor press). |
| **2308334** | **THERMOCOUPLE ASSEMBLY** |
| **2288917** | **BALL CUP ASSEMBLY, WEAR TEST** |
| **2288919** | **CUP DISC** |
| **2288920** | **BALL CLAMP** |
| **2346643** | **BALL CUP** |
| **2346644** | **BALL CUP NUT** |

**2346639** **KRL MECHANICAL SHEAR STABILITY ADAPTER ASSEMBLY**
The Mechanical Tapered Roller Bearing Shearing Device (KRL), determines shear loss of polymer containing multi-viscosity gear oils used in heavy duty manual transmissions and differentials. Meets CEC L-45-A-99 Viscosity Shear Stability of Transmission Lubricants (Taper Roller Bearing Rig)

**2346640** **KRL TEMPERATURE CONTROLER**
Refrigerated/Heated Recirculation System to control test temperature at 60°C for the Mechanical Shear Stability Adapter. *Please inquire if you should require other temperature ranges.*

**2346637** **FOUR BALL WEAR TEST KIT**

**2346638** **VIBRATION SENSOR ASSEMBLY**

**2346640** **KRL TEMPERATURE CONTROL SYSTEM**

## Scar Measurement Systems

**2346645** High Precision Scar Measurement System

**2246169** Digital Scar Measurement System with SoftWARE

**2346647** Shear Stability Specimen Driver

## Options And Accessories

| Catalog Number | Product Description |
|---|---|
| **2346642** | **ROLLING FOUR-BALL CUP ASSEMBLY**<br>Accommodates lower rolling specimen race for testing under rolling conditions. Includes one lower specimen race (2346648). Purchase of 2346638, Pitting Detection Device, is strongly recommended. |
| **2246168** | **HIGH PRECISION SCAR MEASUREMENT SYSTEM**<br>Includes binocular microscope with X-Y base and digital display of measurement accurate to 0.001 mm. System includes ball cup stand with single ball holder. An optional adapter allows for the reading of the ball scars without removal from the ball cup. |
| **Test Specimens** | |
| **2246165** | **TEST SPECIMEN BALLS**<br>AISI E 52100 steel. 500/box Balls conform to ASTM D2596 and, D2783. |
| **2346646** | **BEARING TEST SPECIMEN**<br>for KRL Test CEC L-45-T-93 |
| **2346648** | **ROLLING FOUR-BALL SPECIMEN RACE**<br>Replacement lower specimen race for evaluating materials under rolling conditions |

Test balls and disks are available in a wide range of materials, surface finishes and hardness.
Please contact EXPOTECH USA Sales Representative for pricing and availability.

## For All of Your Lubricant and Materials Testing

### Lubricants
- Pin and Vee Block
- Block-on-Ring
- Timken EP
- Tapping Torque
- Panel Coker
- High Temperature/High Speed Bearing
- Four Ball Wear
- Four Ball EP
- High Temperature Wheel Bearing
- Thermal Oxidation Stability (L60-1)
- Fretting Wear
- Hydrolytic Stability
- Grease Corrosion Test
- Isothermal Oxidation
- Hydraulic Fluid Pump Stand (Vickers and Conestoga)

### Fuels and Solvents
- Ball on Three Disk Fuel Lubricity
- Thin Film Evaporator
- Fuel Deposit Simulator

### Materials
- Journal Bearing
- Multi-Specimen
- Crossed Cylinders
- Low Velocity Friction Apparatus
- Pin on Disk
- Coefficient of Stoption
- Magnetic Media and Paper Wear
- Life Performance Face Clutch System
- Thin Coating Wear (Electrical Contacts)
- Dual Drive Rolling Contact Fatigue
- High Speed Bearing/Mechanical Clutch

### Abrasion and Erosion
- Dry Sand/Rubber Wheel
- Air Jet Erosion
- Miller Number Slurry

## Dry Sand/Rubber Wheel Apparatus

### Applications And Standard Test Methods

**Suitable for testing:**
- Metals
- Glass
- Plastics
- Composite materials
- Ceramics
- Coatings

**Applications include:**
- Industrial Equipment
- Paints
- Plastics
- Coatings
- Slurry Abrasion
- Construction/Farm Equipment

| | |
|---|---|
| **ASTM G65** | Standard Test Method for Measuring Abrasion Using the Dry Sand/Rubber Wheel Apparatus |
| **ASTM B611** | Standard Test Method for Abrasive Wear Resistance of Cemented Carbide |
| **ASTM G105** | Standard Test for Conducting Wet Sand/ Rubber Wheel Abrasion Tests |
| **SAE Recommended Practice** | Resistance to Abrasive Wear Using Rubber Wheel Abrasion Machine |

### System Description

**Speed And Velocity:**

Variable speed control, 350 rpm max.
6.65" steel wheel (ASTM B611): 609.3 fpm max.
7" rubber wheel (SAE or ASTM G105): 641.4 fpm max.
9" rubber wheel (ASTM G65): 824.7 fpm max.

**Load:**

2.5 to 1 lever system with dead weights. Bale rod weights supplied.
Test loads to 75 lbs max.

**Test Conditions:**

Standard Dry Sand Test Configuration. Optional Systems available for Wet Sand and other types of slurries.

**Test Duration And Revolution Counter:**

Timer Control System for automatic test shutoff and Cycle counter with built-in automatic cutoff (standard).

**Space Requirements**:

Bench Top: 60 in. (L) x 24 in. (D) x 40 in. (H)

**Shipping Information:**

615 lb., 42 in. (L) x 36 in. (W) x 42 in. (H)
150 lb., 31 in. (L) x 31 in. (W) x 36 in. (H)
Shipping dimensions and weights are typical and subject to change.

**2331852 DRY SAND/RUBBER WHEEL APPARATUS**

Standard items included with Test Machine:
9 inch Rubber Wheel (2)
2.5 to 1 Load Lever System (30 lbs. Bale Weights)
Specimen Holder
Variable Speed Motor 350 RPM max
Test Cycle Counter & Cutoff
Exhaust Outlet
Wheel Dresser Assembly

**2331853 WET SAND OPTION (SAE Method, ASTM B611 and G105)**

- Slurry Chamber
- Specimen Holders
- Stirring Paddles



Phone: 281-496-0900 sales@expotechusa.com www.expotechusa.com

| | |
|---|---|
| **Astm G65 Test Wheels** | |
| **2325890** | **9 INCH RUBBER WHEEL**<br>58 to 62 Shore A |
| **Astm G105 Test Wheels** | |
| **2331855** | **7 INCH RUBBER WHEEL**<br>68 to 72 Shore A |
| **2331856** | **7 INCH RUBBER WHEEL**<br>58 to 62 Shore A |
| **2331857** | **7 INCH RUBBER WHEEL**<br>48 to 52 Shore A |
| **Astm B611 Test Wheels** | |
| **2325886** | **6.65 INCH STEEL WHEEL**<br>AISI E 52100 steel. 500/box Balls conform to ASTM D2596 and, D2783. |
| **Test Materials And Supplies** | |
| **2325883** | **ASTM G65 REFERENCE TEST SPECIMEN**<br>AISI D-2 Tool Steel, 59 to 60 HRC |
| **2325884** | **ASTM G65 REFERENCE TEST SPECIMEN**<br>AISI H-13 Tool Steel, 47 to 48 HRC |
| **2325885** | **TEST SAND, AFS 50/70 (as per ASTM G65)**<br>50 lb/bag |
| **2331854** | **ALUMINA OXIDE, 30 grit (as per ASTM B611)**<br>50 lb/bag |
| **2325892** | **REPLACEMENT SAND NOZZLE, CALIBRATED**<br>300 to 400 g/min sand flow |
| **2325891** | **WHEEL DRESSING TOOL** |

## For All of Your Lubricant and Materials Testing

### Lubricants

- Pin and Vee Block
- Block-on-Ring
- Timken EP
- Tapping Torque
- Panel Coker
- High Temperature/High Speed Bearing
- Four Ball Wear
- Four Ball EP
- High Temperature Wheel Bearing
- Thermal Oxidation Stability (L60-1)
- Fretting Wear
- Hydrolytic Stability
- Grease Corrosion Test
- Isothermal Oxidation
- Hydraulic Fluid Pump Stand (Vickers and Conestoga)
- Thermal Fouling Tendencies (FT)2

### Abrasion and Erosion

- Dry Sand/Rubber Wheel
- Air Jet Erosion
- Miller Number Slurry

### Fuels and Solvents

- Ball on Three Disk Fuel Lubricity
- Thin Film Evaporator
- Fuel Deposit Simulator
- 400 Thermal Oxidation Tester for ASTM D3241 (JFTOT Procedure)

### Materials

- Journal Bearing
- Multi-Specimen
- Crossed Cylinders
- Low Velocity Friction Apparatus
- Pin on Disk
- Coefficient of Stoption
- Life Performance Face Clutch System
- Thin Coating Wear (Electrical Contacts)
- Dual Drive Rolling Contact Fatigue
- High Speed Bearing/Mechanical Clutch

## Air Jet Erosion Test Machine

ASTM G76 Standard Test Method for Conducting Erosion Tests by Solid Particle Impingement Using Gas Jets

The Air Jet Erosion Test System controls a repeated impact erosion approach involving a small nozzle delivering a stream of gas containing abrasive particles which impact the surface of a test specimen. The amount of weight loss per unit of time represents the erosion or wear rate, providing laboratory scale erosion measurements under a range of conditions. The Test System may be used to rank the erosion resistance of materials, coatings, platings, epoxies, weldments, sprays, paints, and similar products under the controlled conditions of the test.

The test system uses dry air (100 psi max) and a nozzle tube to control particle velocity and an adjustable media feed nozzle to control the particle feed rate of the abrasive impacting the test sample. An adjustable test sample holder controls the angle of incidence from 15° to 90°.

The test system accommodates standard or user selected abrasive media. The distance from the nozzle to the flat specimen surface is adjustable and is controlled with a micrometer. The test system includes a Start/Stop time controller and a mechanical jet flow shutter, and an exhaust vent (exhaust system not included).

### Features & Specifications

**Media Feed:**
Digital display of flow wheel RMP to control the destiny of sand media. Four pound media feed chamber.

**Nozzle Pressure:**
Digital display of pressure at nozzle.

**Flow Rate:**
Includes air flow indicator and regulator (Range 0 - 30 LPM).

**Test Time:**
Digital timer/controller for automatic test duration.

**Angular Adjustments:**
Precision scaled adjustment for setting the angle of incidence of sand against specimen (Range 15-90 degrees).

**Nozzle Distance Adjustment:**
Micrometer adjustment for accurately setting nozzle to specimen distance (Range 0.075 to 1.000 inch).

**Vacuum Exhaust:**
Minimum of one inch of mercury column required (source not provided).

**Pneumatic:**
0-100 psig required (minimum pipe inside diameter 3/8”) (source not provided).

**Electrical:**
220 volts AC single phase, with a 15 amperage requirement.

**Wear:**
Measured by the amount of weight loss per unit of time. This represents the erosion or wear rate.

**Astm Standard:**
G-76 “Conducting Erosion Tests by Solid Particle Impingement using Gas Jets”.

**2331847 AIR JET EROSION TEST MACHINE COMPLETE**

Reference Material (ASTM G76) Test Specimens
**2331848** 1020 Steel, HRB 68-72, 30 mm x 10 mm x 2 mm
**2331849** 1020 Steel, HRB 68-72, 2” x 2” x 1/16”
**2331850** 50 micro meters Aluminum Oxide
Grade 240 grit, 50 lb.
Other materials available on request.



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## Lubricity Tester

The Lubricity Tester has been designed with the lubricant salesman in mind. It is a portable, simple, low cost, light weight sales demonstration unit to visually show and compare product quality.

This tester is simple to operate and understand. A test roller is loaded manually with the torque wrench against a test ring and the friction between the parts is indicated with an Amp Meter. With the optional, mechanical loading system, constant load may be applied and maintained during the test. The cost per demonstration is low, with each test roll used approximately five times and the test ring changed as needed.

The FLC Lubricity Tester is ruggedly built and attractive, with polished chrome parts and base. It will be a convincing sales tool to increase your sales effectiveness.

### Lubricity Tester

¼ HP motor, Three-Wire cord with plug.
Approximate Shipping Weight: 38 lbs.
Standard Items Included with all Testers:

- Test Ring
- Test Rolls (50)
- Carrying Handle
- Oil Sample Cup
- Overload/Overheat Protection
- Test Ring Removal Wrench
- Oil Resistant Base Plate

The standard Lubricity Tester comes with a Beam-Style Torque Wrench (ft-lb).

The Dead Weight Loading System replaces the Beam-style Torque Wrench for hands-free operation.

The Mechanical Loading System includes:
- Lead-Screw Load Mechanism
- 0-175 ft-lb Dial Indicating Torque Wrench (replaces Beam-style Torque Wrench)
- Maximum Load Display Needle

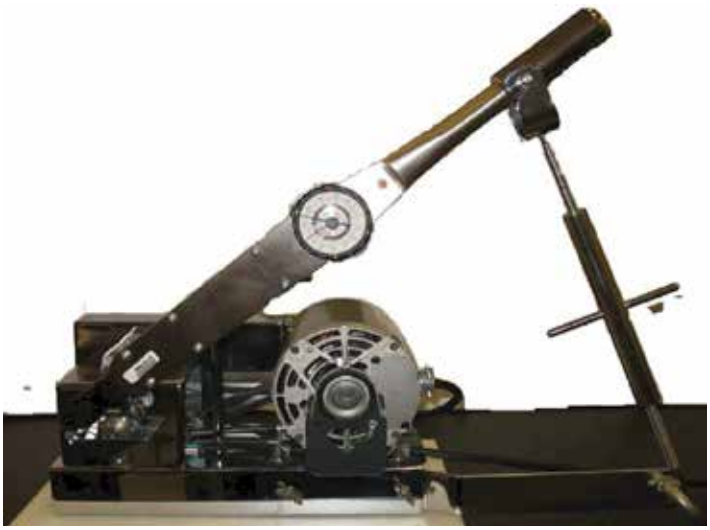
The Lubricity Tester is approximately 70 lbs and is normally shipped in a container 20" x 15" x 13" (LWH). This excludes any supplies or spare parts ordered with the unit.

### Ordering Information

| Catalog Number | Product Description | |
|---|---|---|
| **2352622** | FLC Lubricity Tester, 110VAC | |
| **2352623** | FLC Lubricity Tester, 220VAC | |
| **2352624** | FLC Lubricity Tester, Dead Weight Loading System, 110VAC | |
| **2352625** | FLC Lubricity Tester, Dead Weight Loading System, 220VAC | |
| **2352626** | FLC Lubricity Tester, Mechanical Loading System, 110VAC | |
| **2352627** | FLC Lubricity Tester, Mechanical Loading System, 220VAC, 50Hz | |
| **2352628** | FLC Lubricity Tester, Mechanical Loading System, 220VAC, 60Hz | |
| **Optional Items for All Lubricity Testers** | | |
| **2352629** | Dial Indicating Torque Wrench, 0 – 175 ft-lb | |
| **2352630** | Dial Indicating Torque Wrench, 0 – 250 ft-lb | |
| **Test Specimens** | | |
| **2329601** | Test Ring, S-25<br>SAE 4620, Rc 58-63, 22-28 rms Conforms to ASTM D2981, D3704 and G77 | 25/box |
| **2352631** | Test Roller, 4719 Steel, Rc 60-64,<br>15 rms max. | 50/box |
| **Service Parts** | | |
| **2352632** | Shaft Assembly (Less Test Race) | |
| **2352633** | Test Ring Retainer | |
| **2352634** | Flat Head Cap Screw (For Shaft) | |
| **2352635** | Amp Meter (110 VAC) | |

| Catalog Number | Product Description |
|---|---|
| 2346659 | Torque Wrench (Beam Type) |
| 2352637 | Motor |
| 2352638 | Flange Block Bearing (set) |
| 2352639 | Small Pulley – Motor (50 and 60 Hz) |
| 2352640 | Large Pulley - Specimen Shaft (60 Hz) |
| 2352641 | Large Pulley - Specimen Shaft (50 Hz) |
| 2352642 | Belt (50 Hz) |
| 2352643 | Belt (60 Hz) |
| 2352644 | Switch (110 VAC) |
| 2352645 | Switch (220 VAC) |
| 2352646 | On-Off Switch Plate |
| 2352647 | Cord Set, with Terminals (110 VAC) |
| 2352648 | Cord Set, with Terminals (220 VAC) |
| 2352649 | Collar |
| 2352650 | Oil Cup Retainer Spring |
| 2352651 | Nut and Bolt Set |
| 2352652 | Thumb Screw |
| 2352653 | Oil Cup (Chrome Plated) |
| 2352654 | Test Roll Clamp (Chrome Plated) |
| 2352655 | Amp Meter Mount (110 VAC) |
| 2352656 | Amp Meter Mount (220 VAC) |
| 2352657 | Base (Chrome Plated) |
| 2352658 | Belt Guard (Chrome Plated) |
| 2352659 | Handle (Chrome Plated) |
| 2352660 | 5/32” Long Arm Hex Wrench |

**Lubricity Tester with optional Dead Weight Loading System**



**Lubricity Tester with optional Mechanical Loading System**

## Lubricity Tester Instructions Sales Demonstration Unit

- Clean the oil cup, test roll and test ring with a safe, non-chlorinated solvent.
- Mount the test roll in place so any previously worn section will not be in contact with the test ring.
- Check the test ring for galling damage. Polish the test ring with emery paper to smooth surface, if required. (The test ring should be replaced as needed.)
- Place a small amount of the fluid to be tested in the oil cup so the ring will pick up fresh fluid as it passes through the cup. If grease is to be tested, coat the ring liberally with grease. If an aerosol product is to be tested, spray the entire ring as it is rotating.

**Sales Demonstration 1: Load Carrying Capacity Test**

- Apply load with torque wrench and watch amp meter until it reaches 7 – 8 amps (3 – 4 on 220V). Note load required on torque wrench (Note 1)
- Change product and rerun the same as before and compare the load required to reach 7 – 8 amps.

**Sales Demonstration 2: Load Carrying Capacity Test (Additive Effect)**

- Fill the oil cup with base fluid. Apply load with torque wrench and watch amp meter until it reaches 7 – 8 amps (3 – 4 on 220V). Add fluid additive, and if friction is reduced, the reading on the amp meter should drop.

**Sales Demonstration 3: Friction Reduction**

- Apply desired load with torque wrench. Record amp reading.
- Change product and apply same load. Compare friction as indicated by the amp meter.

**Sales Demonstration 4: Wear Reduction**

- Apply desired load with torque wrench. Observe wear scar.
- Change product and apply same load. Compare size of wear scar.

Other demonstration methods may be used to show product effects.

*Note 1: Motor has automatic overload protection and will shut off it should be overheated. Wait several minutes until motor "clicks" before restarting.*

# Thin Film Evaporometer (Shell Development Design)

The Thin Film Evaporometer is a versatile instrument for the accurate determination of the evaporation rate of volatile materials under controlled conditions of temperature, humidity and air flow. This system provides reliable volatility characteristics in compliance with ASTM D3539 Method B for Automatic Recording.

The test results are absolute; unaffected by hydroscopic or other moisture effects, and independent of subjective observations.

The Thin Film Evaporometer consists of two chambers: an outer chamber which serves as a constant temperature environment, and an inner chamber where the evaporation of the sample takes place. The inner cabinet temperature, humidity and air flow are closely controlled.

## Standard Test Method

**ASTM D3539:** - Standard Test Method for Evaporation Rates of Volatile Liquids by Shell Thin-Film Evaporometer, Method B for Automatic Recording.

## Features & Specifications

**Data Acquisition:**
Realtime data display and storeage of test chamber temperatrue and relative humidity and test sample mass versus test time

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**Weight Sensing:**
High Precision Balance with Filter Paper Hanger

**Air Or Nitrogen:**
Extra Dry Gas Supply to achieve 0 to 5% Relative Humidity in the Inner Cabinet. 20 psig, 21 liters per minute flow rate. Gas supply and pressure regulator not included with system.

**Temperature Control:**
Automatic Control and Regulation of Air Temperature

**Temperature Range:**
20 to 65°C (70 to 150°F)

**Space Requirements:**
Outer Cabinet: 17" w x 21½" d x 30½" h  Weight: Approx. 135 lbs.

**Power:**
115 VAC 60 Hz, Single Phase, 15 Amps. 220 VAC 50 Hz optional.

**Shipping Information:**
Crate #1: 255 lbs. 48 x 36 x 48 inches (L x W x H)
Crate #2: 200 lbs. 36 X 36 X 36 inches (L x W x H)

## Summary of the Test Method:

A known volume of liquid is spread on a known area of filter paper that is suspended from a sensitive balance in a cabinet. Dried air or nitrogen at 25° C is passed through the cabinet at a known rate. The loss of weight of the filter paper/liquid is determined and plotted against time.

The rate of evaporation of volatile liquids from a solution or dispersion is important because it affects the rate of deposition of a film and flow during deposition, and there by controls the structure and appearance of the film. In the formulation of paints and related products, solvents are chosen based on the evaporation characteristics appropriate to the application technique and the curing temperature.

## System Description

### 2352607 Thin Film Evaporometer with SoftWARE™

Complete Test System with Test Cabinet with humidity and temperature control and SoftWARE™ Data Acquisition and Control. 115 VAC, 60 Hz System includes Test Cabinet, PC with SoftWEAR™, Temperature Control System, Sample Syringe and Needle, and Package of Filter Paper.

### Thin Film Evaporometer with SoftWARE™

Complete Test System with Test Cabinet with humidity and temperature control and SoftWEAR™ Data Acquisition and Control. 230 VAC, 50 or 60 Hz System includes Test Cabinet, PC with SoftWEAR™, Temperature Control System, Sample Syringe and Needle, and Package of Filter Paper.

### Test Sample Syringe with Needle

A 1.00 ml hypodermic syringe equipped with a 225 mm stainless steel needle

### Test Sample Filter Paper Disks

Fast, open-textured filter paper, 90 mm in diameter

## For All of Your Lubricant and Materials Testing

### Lubricants

- Pin and Vee Block
- Block-on-Ring
- Timken EP
- Tapping Torque
- Panel Coker
- High Temperature/High Speed Bearing
- Four Ball Wear
- Four Ball EP
- High Temperature Wheel Bearing
- Thermal Oxidation Stability (L60-1)
- Fretting Wear
- Hydrolytic Stability
- Grease Corrosion Test
- Isothermal Oxidation
- Hydraulic Fluid Pump Stand (Vickers and Conestoga)

### Fuels and Solvents

- Ball on Three Disk Fuel Lubricity
- Thin Film Evaporator
- Fuel Deposit Simulator

### Materials

- Journal Bearing
- Multi-Specimen
- Crossed Cylinders
- Low Velocity Friction Apparatus
- Pin on Disk
- Coefficient of Stoption
- Magnetic Media and Paper Wear
- Life Performance Face Clutch System
- Thin Coating Wear (Electrical Contacts)
- Dual Drive Rolling Contact Fatigue
- High Speed Bearing/Mechanical Clutch

### Fuels and Solvents

- Dry Sand/Rubber Wheel
- Air Jet Erosion
- Miller Number Slurry



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## Life Performance of Automotive Wheel Bearing Grease Test Machine

The High Temperature Wheel Bearing Test Machine is operated with a modified, automobile, front wheel hub-spindle-bearing assembly. The grease is distributed in 2 bearing assemblies. The bearings are thrust loaded to 111 N; the hub is rotated at 1000 rpm; and the spindle temperature is maintained at 160°C for 20 h on, 4 h off operating cycle. The test is terminated when grease deterioration causes the drive motor torque to exceed a calculated motor cut-off value. Grease life is expressed as the accumulated on-cycle hours.

Alternatively, the tester is used for determining leakage tendencies of grease using the same test conditions run for a period of 20 h. The condition of the bearing surface is noted at the end of the 20 h period as well as the amount of oil and/or grease collected.

### Features & Specifications

**Load:** Thrust Load Applied to Test Bearing (111 N)

**Speed:** 1/2 HP, Variable Speed Motor, up to 1745 rpm

**Torque:** Continuous Display with selectable high limit cutoff

**Temperature:** Controllable 160 ± 1.5°C. Over-temperature safety cutoff

**Space Requirements:** Benchtop: 50 x 24 x 36 inches

**Power:** 220 Volts, 60 Hz, Single Phase, 15 Amps. 50 Hz optional

**Shipping Information:** 1/2 HP, Variable Speed Motor, up to 1745 rpm

### Standard Test Method

**ASTM D3527**: - Standard Test Method for Measurement of the Life Performance of Automotive Wheel Bearing Grease

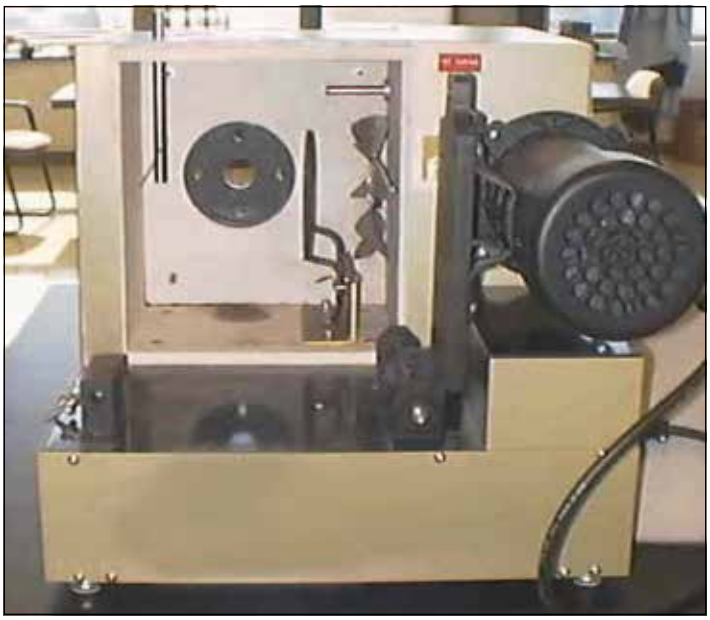
**ASTM D4290:** Standard Test Method for Measurement of the Leakage Tendencies of Automotive Wheel Bearing Grease Under Accelerated Conditions.

**2305035 LIFE PERFORMANCE OF AUTOMOTIVE WHEEL BEARING GREASE**

The tester consists of seven major components: the control cabinet, mechanical section and oven, hub assembly, oil collector and slinger, insulated door, grease packer and hub assem-bly. The oven is electrically heated and thermostatically controlled to maintain spindle tem-perature. A safety over-temperature control has been added to prevent superheating of the oven and spindle assembly. The control cabinet monitors and displays motor speed, oven temperature, spindle temperature, time, cycles and torque. The slinger is used to prevent grease from creeping along the hub and being slung off past the grease collector. Greases that creep during a test can lead to erroneously low results if not tested using the slinger. The 1/2 HP motor is selected to operate at 1725 rpm. A DC motor controller allows the user to select the rotational speed, typically 1000 rpm, using a 10 turn potentiometer.

**2305036** **Inboard Bearing Set**

**2305037** **Outboard Bearing Set**



### For All of Your Lubricant and Materials Testing

**Lubricants**

- Pin and Vee Block
- Block-on-Ring
- Timken EP
- Tapping Torque
- Panel Coker
- High Temperature/High Speed Bearing
- Four Ball Wear
- Four Ball EP
- High Temperature Wheel Bearing
- Thermal Oxidation Stability (L60-1)
- Fretting Wear
- Hydrolytic Stability
- Grease Corrosion Test
- Isothermal Oxidation
- Hydraulic Fluid Pump Stand (Vickers and Conestoga)

**Fuels and Solvents**

- Ball on Three Disk Fuel Lubricity
- Thin Film Evaporator
- Fuel Deposit Simulator

### Materials

- Journal Bearing
- Multi-Specimen
- Crossed Cylinders
- Low Velocity Friction Apparatus
- Pin on Disk
- Coefficient of Stoption
- Magnetic Media and Paper Wear
- Life Performance Face Clutch System
- Thin Coating Wear (Electrical Contacts)
- Dual Drive Rolling Contact Fatigue
- High Speed Bearing/Mechanical Clutch

### Abrasion and Erosion

- Dry Sand/Rubber Wheel
- Air Jet Erosion
- Miller Number Slurry

## Miller Number Slurry Abrasivity Test Machine

The Miller Number Slurry Abrasivity Test Machine can be used to develop data from which either the relative abrasivity of any slurry (Miller Number), or the response of different materials to the abrasivity of different slurries (SAR Number), can be determined, meeting the requirements of ASTM G75, "Test Method for Determination of Slurry Abrasivity (Miller Number) and Slurry Abrasion Response of Materials (SAR Number)."

The Miller Number is an index of the relative abrasivity of slurries. Its primary purpose is to rank the abrasivity of slurries in terms of the wear of a standard reference material. The wear damage on the block is worse as the Miller Number gets higher.

The SAR Number is an index of the relative abrasion response of materials as tested in any particular slurry of interest. The SAR Number is a generalized form of the Miller Number applicable to materials other than the referenced material used for the Miller Number determination. A major purpose is to rank construction materials for use in a system for pumping and fluid handling equipment for a particular slurry. The slurry damage on the specimen of material being tested is worse as the SAR Number gets higher.

### Standard Test Method

**ASTM G75** : - Standard Test Method for Determination of Slurry Abrasivity (Miller Number) and Slurry Abrasion Response of Materials (SAR Number).

### Features & Specifications

**2352616 Miller Number Slurry Abrasivity Test Machine**

**220 V, 60 Hz**

Standard System Includes: Machine with Motor Electronic Predetermining Counter Four-Trough Slurry Container List of Miller Number Test Results Operation Manual

**Options And Accessories**

| Catalog Number | Product Description |
|---|---|
| **2352617** | **LAP, NEOPRENE MOLDED** (Set of 4) |
| **2352618** | **BLOCK HOLDER, DELRIN** |
| **Test Consumables** | |
| **2352619** | **Wear Block,** 27% Chrome Iron |
| **2352620** | **AFS 50-70 Sand** for wear testing, 50 pounds |

# Four-Ball Wear Test Machine

The Four Ball Wear Test Machine is used to determine the relative wear-preventing properties of lubricating fluids and greases in sliding and rolling applications.

Three ½ inch diameter steel balls are clamped together and covered with the test lubricant. A fourth ½ inch diameter steel ball is pressed into the cavity formed by the three clamped balls for three point contact, and rotated for a set duration. Lubricants are compared using the average size of the scar diameters worn on the three lower clamped balls.

The Standard Four Ball Wear Test Machine is supplied with a 1/2 HP motor to drive the rotating ball at 1200 rpm. A mechanical lever arm applies loads up to 50 kilograms on the ball specimen. A digital temperature system controls the initial temperature set point (ambient to 200° C) and displays the lubricant temperature during the test. A digital timer system controls the test duration (1 second to 999 hours).

The Four-Ball Variable Drive Wear Test Machine is supplied with a 1 HP variable speed motor with a standard operating range of 60 to 3600 rpm. Optional systems are available for rotational speeds up to 10,000 rpm. A pneumatic load system applies loads up to 180 kilograms on the ball specimen. A digital friction measurement system displays the test friction force (0 to 1000 grams). A digital temperature system controls the initial temperature set point (ambient to 200° C) and displays the lubricant temperature during the test. A digital timer system controls the test duration (1 second to 999 hours). An optional system is available for controlling the atmosphere in the test cup.

The Four-Ball Wear Test Machine is designed to provide the precision loading required for performing accurate wear tests. It is the only test machine that has proven through cooperative inter-laboratory testing to meet the requirements of the precision as stated in the ASTM Standard Test Methods D2266 and D4172. Insist on the Four-Ball Wear Test Machine to meet your ASTM testing requirements.

## Specifications

**Load:**
Variable Drive Four Ball Wear Tester: Pneumatic loading, 180 kg max.
Standard Four Ball Wear Tester: Dead weight and mechanical lever, 50 kg max.

**Speed:**
Variable Drive Four Ball Wear Tester: 60 to 3600 rpm continuously variable. 1 to 10,000 rpm with speed conversion options.
Standard Four Ball Wear Tester: 1200 rpm

**Temperature Control:**
Digital control from ambient to 200°C
Auto start-up upon reaching test temperature

**Test Duration:**
Digital Programmable Timer (1 second to 999 hours)

**Friction Measurement:**
Variable Drive Four Ball Wear Tester: Load Cell Assembly and Digital Display of Test Friction Force

**Environments:**
Dry or lubricated (fluids, greases, dry film)

**Space Requirements:**
66 in (H) x 36 in (D) x 32 in (W) (168 cm x 91 cm x 81 cm)

**Utility Requirements:**
220V, 60Cycles (50 Cycle optional), Single Phase, 10 Amps 80 psig clean dry air (Model F-1519)

**Shipping Information:**
750 lb. (341 kg); 43 in x 36 in x 75 in (109 cm x 91 cm x 191 cm)

## Test Procedures

**ASTM D2266**
Standard Test Method for War Preventative Characteristics of Lubricating Grease (Four-Ball Method)

**ASTM D4172**
Standard Test Method for Wear Preventative Characteristics of Lubricity Fluids (Four-Ball Method)

**ASTM D5183**
Standard Test Method for Determination of the Coefficient of Friction of Lubricants using the Four-Ball Wear Test Machine

**IP300:**
Rolling Contact Fatigue Test for Fluids in a Modified Four-Ball Machine



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## Components And Options

**2284073 VARIABLE DRIVE FOUR-BALL WEAR TEST MACHINE**

Includes the following:

- 1 HP Variable Speed Motor
  - 60 to 3600 rpm
  - Speed Indicator and Controller
- Digital Test Duration Timer
- Friction Measurement System
  - Load Cell Assembly
  - Air Bearing Assembly
- Pneumatic Loading System
  - 180 Kg max load
  - Load Regulator and Display
- Temperature Controller System
  - Heater Assembly (200° C max)
  - Automatic Test Start
- Ball Cup Assembly and Fixtures
  - Ball Cup with Thermocouple
  - Ball Chuck
  - Ball Cup Tightening Base
  - Ball Cup Disk Adapter
  - 0-25 lb-in Torque Wrench
- Emergency Stop Switch

**2284072 STANDARD FOUR-BALL WEAR TEST MACHINE**

Includes the following:

- ½ HP Single Speed Motor, 1200 rpm
- Mechanical Loading System
  - Lever Arm and Weight Hager
  - 50 Kg max load
- Digital Test Duration Timer
- Temperature Controller System
  - Heater Assembly (200° C max)
  - Automatic Test Start
- Ball Cup Assembly and Fixtures
  - Ball Cup with Thermocouple
  - Ball Chuck
  - Ball Cup Tightening Base
  - Ball Cup Disk Adapter
  - 0-25 lb-in Torque Wrench
- Emergency Stop Switch

## Measurement Systems

**2246168 HIGH PRECISION SCAR MEASUREMENT SYSTEM**

Includes binocular microscope with X-Y base and digital display of measurement accurate to 0.001 mm. System includes ball cup stand with single ball holder. Allows reading of ball scar without removal from ball cup.

**2284091 DIGITAL SCAR MEASUREMENT SYSTEM with CCD CAMERA**

Includes a CCD camera and digital display of ball scar and capability of measurement on screen to 0.001 mm. System includes ball cup stand with single ball holder and CCD camera with USB port for recording scar diameters to computerized data acquisition system or host computer. Allows for reading ball scar without removal from ball cup.

## Test Specimens

**2246165 TEST SPECIMEN BALLS**

AISI E 52100 steel. 500/box

Balls conform to ASTM D2596 and, D2783.

**2284094 BALL-ON-THREE-DISK (B.O.T.D.) TEST SPECIMEN SET**

## For All of Your Lubricant and Materials Testing

### Lubricants

- Pin and Vee Block
- Block-on-Ring
- Timken EP
- Tapping Torque
- Panel Coker
- High Temperature/High Speed Bearing
- Four Ball Wear
- Four Ball EP
- High Temperature Wheel Bearing
- Thermal Oxidation Stability (L60-1)
- Fretting Wear
- Hydrolytic Stability
- Grease Corrosion Test
- Isothermal Oxidation
- Hydraulic Fluid Pump Stand (Vickers and Conestoga)

### Fuels and Solvents

- Ball on Three Disk Fuel Lubricity
- Thin Film Evaporator
- Fuel Deposit Simulator

### Materials

- Journal Bearing
- Multi-Specimen
- Crossed Cylinders
- Low Velocity Friction Apparatus
- Pin on Disk
- Coefficient of Stoption
- Magnetic Media and Paper Wear
- Life Performance Face Clutch System
- Thin Coating Wear (Electrical Contacts)
- Dual Drive Rolling Contact Fatigue
- High Speed Bearing/Mechanical Clutch

### Abrasion and Erosion

- Dry Sand/Rubber Wheel
- Air Jet Erosion
- Miller Number Slurry

**Accessories**

| Catalog Number | Product Description |
|---|---|
| 2284075 | **VIBRATION DETECTION SENSOR** Sensor, Display and Cutoff System used for determining onset of fatigue when testing materials under rolling conditions. |
| 2284077 | **STANDARD BALL CUP ASSEMBLY** Standard Test Cup, Disk, Clamp Ring, Lock Nut and Thermocouple |
| 2284078 | **ROLLING FOUR-BALL CUP ASSEMBLY** Rolling Ball Cup, Lock Nut and Thermocouple |
| 2284079 | **ROLLING FOUR-BALL SPECIMEN RACE** Rolling Test Specimen evaluating materials under rolling conditions. |
| 2284085 | **DISK FIXTURE** For punching ¼ inch diameter disk from 1/16 inch sheet stock (must be used with arbor press). |
| 2255742 | **BALL CHUCK** Holds Fourth ½ inch diameter rotating ball during testing. |
| 2284080 | **THERMOCOUPLE** Ball Cup Thermocouple |
| 2284081 | **DISK ADAPTER** Permits use of three ¼ inch diameter by 1/16 inch thick disk specimens (2284094) in place of lower balls for alternate material combinations. |
| 2284084 | **B.O.T.D. CONVERSION KIT** Includes anti-vibration ball clamp ring, anti-vibration cup disk, light load kit (2246168), calibration weight, 6:1 low speed drive. |
| 2284087 | **LOW SPEED CONVERSION** Allows 1/2 to 25 rpm. For use with 2284073 model only. |
| 2284088 | **HIGH SPEED CONVERSION** Allows 200 to 10,000 rpm. For use with 2284073 model only. |
| 2284089 | **FOUR-BALL WEAR LOAD CALIBRATOR** Calibration Load Cell and Meter for the pneumatic load system on Variable Drive Four-Ball Wear Test Machine, model 2284073. |

# Journal Bearing Test Machine

The Journal Bearing Test Machine is used for determining static and dynamic coefficients of friction and for evaluating wear rates and PV limits of journal bearings radially loaded on a rotating shaft.

The standard specimen configuration is a rotating 3/4" O.D. test shaft in a 3/4" I.D. x 3/4" long specimen bearing. Other sizes can be configured. The bearing is dead weight loaded through a 10:1 lever system or optional microprocessor controlled pneumatic system. The shaft and bearing are contained in a sealed, stainless steel test chamber to allow testing with liquids and controlled atmospheres. The test motion may be either rotating or oscillating.

With the Digital Instrumentation System, speed, specimen temperature, time, test cycles and torque can be electronically monitored. With this system, temperature can be varied and controlled. It also allows the machine operator to preset shutoff points for the machine at predetermined torque levels, test cycles or timed duration. The Two Channel Thermal Printer logs torque and specimen temperature at desired time intervals. Recording systems are available for permanent recording of all key variables.

The Microprocessor Based Test Data Acquisition and Control System allows the user to control and log all significant test variables. Test procedures can be preprogrammed into this system to run the test basically unattended.

Development of the Journal Bearing Test Machine has been in cooperation with SPI Committee on Friction and Wear, the Self-Lubricating Bearings and Materials Committee of ASME and the Solid Lubricants Section of ASTM Committee D2 on Petroleum Products and Lubricants.

## JOURNAL BEARING TEST MACHINE WITH DIGITAL INSTRUMENTATION SYSTEM

### Features and Specifications

**Speed & Velocity:**

Ten turn variable speed control potentiometer. Dual speed ranges, 24 to 478 rpm (4.7 to 94 fpm) and 150 to 3000 rpm (29 to 589 fpm)with Digital Speed Indicator.

**Load:**
Applied through 10:1 lever system with dead weights. Bale rod weights supplied 1/4 lb. to 80-3/4 lb. Maximum test load 807.5 lbs. Optional microprocessor controlled pneumatic load system.

**Test Pressure:**
Minimum test pressure 4.5 psi. Maximum test pressure 1435 psi.

**Environments:**
Wet or dry. Enclosed stainless steel chamber for humidity or circulated special atmospheres.

**Temperature Control:**
Controlled system with digital proportional controller indicator, heater and automatic temperature start-up.

**Motion:**
Unidirectional or optional oscillatory.

**Torque:**
Load cell with digital panel meter and digital thermal printer. Automatic torque cutoff. Optional field calibration system. Provision for break-away (static) friction measurement.

**Wear:**
Continuous display dial indicator on lever arm. Allows rate of wear. Each division is 0.0002 in. Optional depth micrometer can be used to measure at each end of test bearing. Optional electronic recording of wear.

**Specimen Temperature:**
Panel mounted digital indicator with high temperature cutoff and digital thermal printer. Thermocouple included.

**Test Time:**
Digital timer/controller for automatic start up or shutoff.

**Revolution Counter:**
Panel mounted cycle counter with automatic cutoff.

**Motor:**
1 HP, 220 volt, single phase, variable speed with plus or minus 1% of full speed range accuracy feedback control.

**Utility Requirements:**
220 V, Single Phase, 12 Amps max., 60 Hz. Optional 50 Hz
80 psig clean dry air required for Microprocessor Loading and Data Acquisition and Control System.

**Space Requirements:**
Bench top: 60 in. (L) x 24 in. (D) and 28 in. (H)

**Shipping Information:**

| | |
|---|---|
| 380 lb. - | 43 in. (L) x 36 in.(W) x 42 in. (H) |
| 160 lb. - | 31 in. (L) x 31 in. (W) x 36 in. (H) |
| 150 lb. - | 31 in. (L) x 31 in. (W) x 36 in. (H) with Microprocessor Data Acquisition and Control |



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**Test Procedures:**
Development of the Journal Bearing Test Machine has been in cooperation with SPI Committee on Friction and Wear and the Self-Lubricating Bearings and Materials Committee of ASME and the Solid Lubricants Section of ASTM Committee D2 on Petroleum Products and Lubricants.

**Specimens:**
Standard: Test shaft 3/4" O.D. Bearing 3/4" I.D. x 3/4".
Special modifications available for smaller size bearings and shafts.

## Components And Options

### Journal Bearing Test Machine
Standard items included with machine:
- ¾" x ¾" Specimen Holder
- Specimen Shaft Pulling Tool
- 80 ¾ lb. Loading Weights
- Dual Speed Range
- Dial Wear Indicator
- Static Torque Wrench
- Stainless Steel Chamber
- 1 HP Variable Speed Motor

### Digital Instrumentation System
Standard items included with machine:
- Torque Indicator & Cutoff
- Timer/Controller
- Test Cycle Counter & Cutoff
- Temperature Controller
- RPM Indicator Automatic
- Temperature Startup
- Specimen Temperature Indicator & Cutoff
- Torque, Temperature and RPM Analog Output
- Channel Microcomputer Thermal Data Printer (Torque & Temperature)

### Microprocessor Data Acquisition and Control System

Computer based system for controlling and logging test variables and data. The system allows the user to keyboard enter test parameters for automatic test control.

Includes:
- Color Video Display
- Operator Keyboard
- Specimen Wear Sensor
- Color Printer
- Controlled Rate of Speed
- Friction Sensor
- Variable Rate/Pneumatic Loading System (Replaces 10:1 Lever System and Loading Weights. Requires 80 psig clean, dry air)
- Specimen Temp Sensors
- Menu Driven User Friendly Test Control & Data Acquisition Program
- DOS, Lotus 1, 2, 3™
- IBM CPU System with Math Coprocessor with Surge Protector
- Hard Disk Drive
- 3½" Diskette
- User Memory RAM
- CD, Read/Write
- Internal Modem

*This unit is designed as an integrated system for acquiring test data on the Journal Bearing Test Machine. Use of computer for other than intended purpose may affect warranty or equipment performance. Unit should be stored and used in an air conditioned environment.*

## Journal Bearing Options

### Microprocessor Controlled Loading System

Replaces standard dead weight loading system. Standard on Microprocessor Based Test Data Acquisition & Control Systems. This pneumatic system allows automatic electronic loading of machines purchased with Digital Control System. Eight point ramp and soak loop. Air is required. (Replaces 80 3/4 lb. Loading System and Dial Wear Indicator. Requires 80 psig clean, dry air.)
Standard items included with Loading System:
- Digital Microprocessor
- Lever Interface
- Pressure Indicator
- Loading System
- Pressure Transducer
- Pneumatic Regulator

### 2329577 Oscillating Drive
Converts rotary motion of test specimens to oscillatory motion, 600 cpm max.

### 2352668 High Speed Oscillating Drive
Permits testing at higher speeds. Speed dependent on angle of oscillation. Maximum speed of 1500 cpm at 20°. Higher angles of oscillation require lower speeds - 90°. 1500 cpm max.

### 2352670 1/4" Diameter Shaft & Bearing Conversion Kit
To convert from standard 3/4 x 3/4 inch to 1/4 diameter x 3/4 inch test bearing. All required adapters and hardware.

### 2352671 Dual Load Range Electronic Calibration Device
Enables user to field calibrate high and low ranges of systems equipped with Microprocessor Controlled Loading or Microprocessor Data Acquisition and Control System. Includes two independent load cell fixtures and dual independently ranged digital meters. Ranges: 5-60 lbs. and 50 – 807.5 lbs.

### 2352672 Journal Specimen Mounting Press and Vise
To press journal bearing into specimen holder.

### 2352673 Depth Micrometer
1" depth micrometer to measure specimen wear.

### 2352674 High Precision Scar Measurement System
Includes binocular microscope with X-Y base and digital display of measurement accurate to 0.001 mm. Test shaft stand and journal bearing holder

### 2053213 Ultrasonic Cleaner
3 qt. capacity with heater, timer, cover and basket. To clean test specimens to ASTM specifications

### 2297360 Variable Humidity Control Cabinet

Allows for controlled humidity atmospheres to be supplied to the test chamber. The relative humidity can be controlled from 5% to 90%. Incoming air is filtered, dried, and then humidified. Regeneration of the dual moisture absorbing towers is automatic, allowing for continuous operation.

### 2297348 Test Fluid Recirculation System

Incorporates a dual action pump to maintain test fluid level. Includes replaceable in-line filter. Used when test program requires filtered fluid with no wear particles. Designed to deliver at one rate and return at a slightly higher rate to eliminate loss of fluids in test chamber area. Includes thermostatically controlled heater and provision for cooling - 3 liter capacity.

## Tapping Torque Test Machine

The Tapping Torque Test Machine performs metal working operations under laboratory test conditions to simulate and measure the process of metal removal and/or deformation. The Tapping Torque Test Machine compares and evaluates the relative performance of tools, lubricants, coolants, and materials for tapping, forming, drawing, drilling and reaming applications.

Applications include Product Formulation and Quality Control, Tool Design and Tool Life, Product Efficiency or Suitability for Use Comparison, and Metal Working Fluid - Material Optimization. The Tapping Torque Tester provides quantifiable data to developers and users of metal working systems.

### Standard Test Method

**ASTM D5619** : - Standard Test Method for Comparing Metal Removal Fluids Using the Tapping Torque Test Machine

### Specifications And Features

**Speed:**
Variable Speed, Unidirectional, 2 HP Motor, 220 VAC, Single Phase, 50 or 60 Hz
Dual Range: 10 to 450 rpm and 20 to 900 rpm

**Driving Torque:**
Dual Range: 0 to 32.5 N-m (288 in-lbs) and 0 to 65.0 N-m (576 in-lbs)

**Tapping Head:**
Procunier™ 3 ALH Tapping Head with precision Lead Screw
(1.5 mm, 6 cm toatal lead travel. Unique design to eliminate axial thrust.

**Concentricity:**
Precision System to maintain Tapping Head to Specimen Table, including Precision alignment and inspection tools for specimen positioning.

Cutting

Drilling

Forming

**Torque Measurement:**
Precision Strain Gage and Pivot Table System, including user calibration for tools. Strain Gage measures torque produced during test operation. User configured system for determination and analysis of torque data.

### Tapping Torque System Options

#### 2305417 METAL FORMING TEST ASSEMBLY

Test Assembly for the evaluation of forming fluids on sheet stock materials under a pure sliding motion. The Metal Forming Test rotates a ½ inch diameter steel ball through a slotted disk.

#### 2305418 REAMING TEST ASSEMBLY

Test Assembly for the evaluation of tools and fluids used in reaming operation. The Reaming Test uses the standard test machine configuration and cutting nut blanks.

#### 2305419 DRILLING TEST ASSEMBLY

Test Assembly for the evaluation of drilling efficiency. Drill Bit enters the test specimen and simulates drilling operation. Special design eliminates axial thrust and ensures consistent repeatable data. System includes alternate Lead Screw for Drilling Applications.

#### 2305420 METAL ROLL FORMING TEST ASSEMBLY

Test Assembly for the evaluation of combined rolling and sliding in metal forming applications. The diameter of a thin walled tube is expanded by the rolling and sliding contact of three test balls fixtured in the forming tool.

Test Assembly includes Adapter and 7% Throw Pin.

#### 2305422 TAPPING TORQUE TEST SPECIMEN INSPECTION KIT (DIGITAL MICROSCOPE)

Microscope assembly for the evaluation test specimen edge wear, built-up edge (BUE), or other cutting edge phenomena. Inspection Kit includes a Binocular Microscope and Digital Camera System with Test Specimen Holders.



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## Test Specimens

### Test Tools:

| | |
|---|---|
| 2305423 | Upper Forming Tool Specimen |
| 2305424 | Upper Reaming Tool |
| 2305425 | Upper Drilling Tool |
| 2305426 | Upper Cutting Tap Specimen, 10 x 1.5 mm |
| 2305427 | Upper Forming Tap Specimen, 10 x 1.5 mm |

### Steel Cutting Blanks:

| | |
|---|---|
| 2305428 | 1018 Steel Cutting Blank |
| 2305429 | 4140 Steel Cutting Blank |
| 2305430 | 1215 Steel Cutting Blank |

### Steel Forming Blanks:

| | |
|---|---|
| 2305431 | 1018 Steel Forming Blank |
| 2305432 | 4140 Steel Forming Blank |
| 2305433 | 1215 Steel Forming Blank |

### Aluminum Cutting Blanks:

| | |
|---|---|
| 2305435 | 6061 Al Cutting Blank |

### Aluminum Forming Blanks:

| | |
|---|---|
| 2305439 | 380 Al Forming Blank |
| 2305440 | 6061 Al Forming Blank |
| 2305441 | 7075 Al Forming Blank |

### Stainless Steel Blanks:

| | |
|---|---|
| 2305442 | 304 SS Cutting Blank |
| 2305443 | 304 SS Forming Blank |

### Roll Forming Specimens:

| | |
|---|---|
| 2305444 | Lower Specimen Washers, Aluminum 5052-H32 |
| 2305445 | Aluminum Tube (6061-T6) Test Specimen, each |
| 2305445 | Steel Tube (1020) Test Specimen, each |

## For All of Your Lubricant and Materials Testing

### Lubricants

- Pin and Vee Block
- Block-on-Ring
- Timken EP
- Tapping Torque
- Panel Coker
- High Temperature/High Speed Bearing
- Four Ball Wear
- Four Ball EP
- High Temperature Wheel Bearing
- Thermal Oxidation Stability (L60-1)
- Fretting Wear
- Hydrolytic Stability
- Grease Corrosion Test
- Isothermal Oxidation
- Hydraulic Fluid Pump Stand (Vickers and Conestoga)

### Fuels and Solvents

- Ball on Three Disk Fuel Lubricity
- Thin Film Evaporator
- Fuel Deposit Simulator

### Materials

- Journal Bearing
- Multi-Specimen
- Crossed Cylinders
- Low Velocity Friction Apparatus
- Pin on Disk
- Coefficient of Stoption
- Magnetic Media and Paper Wear
- Life Performance Face Clutch System
- Thin Coating Wear (Electrical Contacts)
- Dual Drive Rolling Contact Fatigue
- High Speed Bearing/Mechanical Clutch

### Abrasion and Erosion

- Dry Sand/Rubber Wheel
- Air Jet Erosion
- Miller Number Slurry

## Electrostatic Dehydration Precipitation Models

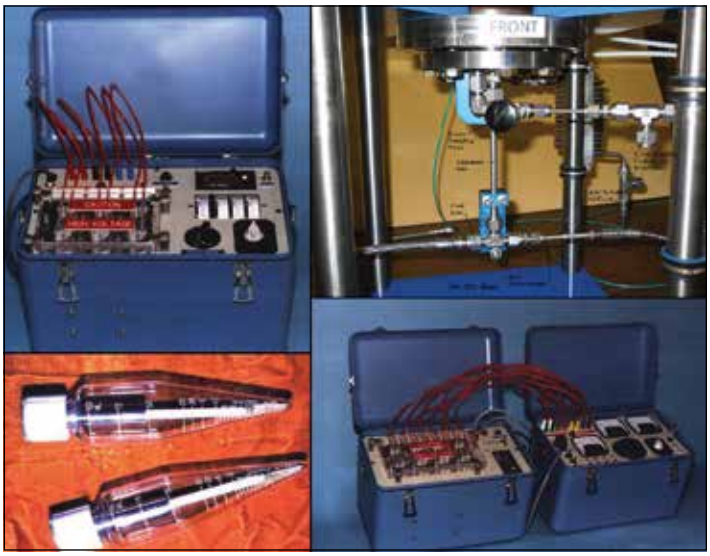
**1. 2289859** - six cell unit, one cabinet, supplied with reusable ABS Plastic shipping crate, very portable. Ideal for moving to various lab/field locations for onsite testing. Max Temp. 100C. Unit contains (3) high voltage transformers (3000V). Two test cells share a common high voltage transformer.

**2. 2281632** - eight cell unit, two cabinets (test cell cabinet & power supply cabinet) . Can be transported but less portable than EDPT-116. (8) high voltage transformers (3000V). One for each test cell. Max Temp. 100C . Better suited for high usage petrochemical laboratory type setting

**3. 1794762** - eight cell unit, three cabinets ( test cell cabinet, power supply cabinet, control cabinet ) . Heavy wall glassware. Laboratory setting usage. (8) high voltage transformers (4000V). One for each test cell. Max Temp. 150C. Suited for customers needing extended temperature capability and higher voltage.

**4. 1793740** - Flow Thru Test Cell , adjustable inlet level inside Test Cell, adjustable electrode spacing, front/back sight glass window into Test Cell. 6000V power supply cabinet with inlet/outlet temperature display. Not supplied with pumps or heating capability. Rated to 150C. Inlet on bottom. Adjustable back pressure valve on top (outlet) .

**5. 2282181** - Glass Test Cell , similar to a Reaction Vessel, adjustable electrode spacing, (6000V) power supply cabinet, not a pressure vessel, PTFE insulators, can be configured with heated jacket, inlet/outlet on top and bottom of vessel, can be configured for multiple adjustable thermocouples to monitor fluid temperature at various levels inside vessel.





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## FUELS TESTING EQUIPMENT


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## Automatic Filter Plugging Tendency Analyzer (FPT)

- Integrated Cooling System equipped with a single stage gas motor compressor CFC free
- Measuring device complete with support for filter, Beakers, PT100 sensor Class A, level sensor, pressure gauge, tubes and joints.
- Pump 20 mL/min
- 6.4" TFT/LCD built-in touch screen panel PC for the managing of the analyzer by means of Lab-Link Software
- USB connection to an external printer or external PC
- Storage capacity for more than 60,000 analysis

### Test Method

Determines the Filter Plugging Tendency (FPT) of distillate fuel oils where the end use demands an exceptional degree of cleanliness. This test is applicable to fuels within the viscosity range of 1.50 to 6.00 mm2/s (cSt) at 40°C. The test is not applicable to fuels that are not clear and bright because water interferes with the measurement of filter plugging. Causes of poor filterability might include fuel degradation products, contaminants picked up during storage or transfer, or interaction of the fuel with the filter media. Any of these could correlate with orifice or filter system plugging, or both.

**Electrical Requirements**
Conforms to the specifications of:
ASTM D2068; IP 387

**Ordering Information**

| Catalog Number | Product Description - Cloud and Pour Point Chamber |
|---|---|
| **2346991** | Automatic Filter Plugging Tendency Analyzer (FPT), 115V 50/60Hz |
| **2346991** | Automatic Filter Plugging Tendency Analyzer (FPT), 220-230V 50/60Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2346993** | Glass Fibre Filters, pk of 100 |
| **2277500** | Calibration Box and Cables |
| **2019851** | Kit of Connectors and Cables for Cold range |

## Oxidation Stability of Fuels, Liquid Baths

### Test Method

Provides an indication of the tendency of gasoline and aviation fuels to form gum in storage. The sample is oxidized inside a stainless steel pressure vessel initially charged with oxygen at 100psi (689kPa) and heated in a boiling water bath. The amount of time required for a specified drop in pressure (gasoline) or the amount of gum and precipitate formed after a specific aging period (aviation fuels) is determined.

### Features and Benefits

- Water/Liquid baths conforming to ASTM and related specifications.

Constant temperature baths for heating 1844044 Oxidation Pressure Vessels in accordance with ASTM specifications.

### Solid Block Oxidation Baths

Solid block baths meet temperature control and other requirements of ASTM and related measurements. While aluminum block design offers operating advantages over the standard boiling water bath, it should be noted that many applicable specifications for this test call for a liquid bath medium. Please refer to the test method for the specific requirements.

## Oxidation Stability of Fuels, Water/Liquid Baths

Two different models, both equipped with low liquid-level controllers in accordance with the latest ASTM specifications. Two-unit water analog-controlled water bath can be flush mounted in a table top if desired, and is equipped with an overflow standpipe/drain to maintain the proper depth when the pressure vessels are inserted, and a plated brass reflux condenser to minimize evaporation loss.

The four/six-unit model can be used with water or oil as a bath medium, and has microprocessor temperature control that provides quick temperature stabilization without overshoot. Dual LED displays provide setpoint and actual temperature values in °C/°F format. A built-in over temperature control circuit interrupts power should the bath temperature exceed a programmed cut-off point. Both models feature double-wall insulated construction with stainless steel tanks, support racks and port covers. Order thermometer separately. The four/six unit model can be ordered with interchangeable racks for performing the ASTM D942, ASTM D323 and D1298 test methods. Please contact your EXPOTECH USA representative for additional information

*Communications software (RS232, etc.) ramp-to-set and other enhanced features are available as extra cost options.*

*Contact your* EXPOTECH USA *representative for information.*

**Specifications**

Conforms to the specifications of: ASTM D525, D873; IP 40, IP 138; ISO 7536; DIN 51780, 51799; FTM 791-3352, 791-3354; NF M 07-012, 07-013

**Maximum Temperature**

Two-Unit Liquid Bath: boiling water

Four/Six-Unit Liquid Bath: 250°F (121°C)

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **1340196** | Glass Sample Container and Cover with pour out spout |
| **1186775** | Gasket. Replacement composition gasket for 1844044 Oxidation Pressure Vessel. |
| **2024304** | Pressure Line. For pressurizing Oxidation Pressure Vessel. 6 ft. (1.83m) long, with quick release coupling for needle valve on pressure vessel and threaded fitting for oxygen tank. |
| **2024306** | Oxygen Manifold Pressure Relief System. Connects to oxygen source to prevent overcharging of vessel. Equipped with relief valve to vent at 125psi and 300 series stainless steel 150psi burst disk assembly. Constructed from 300 series stainless steel. Cleaned for oxygen service. |
| **1340197** | Wrench. For tightening seal on Oxidation Pressure Vessel. |
| **1340197** | Table Socket. Installs in benchtop to aid in tightening seal on Oxidation Pressure Vessel. |
| **1186777** | Bronze Tubing. For connecting pressure recorder to vessel. Flexible seamless helical tubing with protective armor braid and connections. 5 ft (1.52m) long. |
| **2024305** | Burst Disk Assembly. Retrofit kit for Oxidation Pressure Vessel without burst disk assembly. |
| **1394492** | ASTM 22F Thermometer. Range: 204 to 218°F |
| **1394491** | ASTM 22C Thermometer. Range: 95 to 103°C |

| Ordering Information | | | | | |
|---|---|---|---|---|---|
| Catalog Number | Capacity | Temperature Controller | Electrical Requirements | Heater Range | Dimensions lxwxh,in.(cm) |
| **1340196** | 2 vessels | analog | 115V, 50/60Hz, 17.3A | 0-2000W | 24x14x24 (61x36x61) |
| **2024302** | 2 vessels | analog | 220-240V, 50/60Hz, 9.0A | 0-2000W | 24x14x24 (61x36x61) |
| **1844041** | 4-6 vessels | digital | 220-240V, 50/60Hz, 18.1A | 0-3000W | 24x14x29.5 (61x36x75) |

## Oxidation Stability of Fuels, Solid Block Baths

### Test Method

Provides an indication of the tendency of gasoline and aviation fuels to form gum in storage. The sample is oxidized inside a stainless steel pressure vessel initially charged with oxygen at 100psi (689kPa) and heated in a solid block bath. The amount of time required for a specified drop in pressure (gasoline) or the amount of gum and precipitate formed after a specific aging period (aviation fuels) is determined.

### Solid Block Oxidation Baths

Insulated aluminum block baths available in two or four-unit capacity. Baths feature microprocessor temperature control with built-in over temperature protection and dual LED displays for the setpoint and actual values in °C/°F format. The solid block design offers operating advantages over the boiling water bath, and meets temperature control and other requirements of ASTM and related methods. It should be noted, however, that many applicable specifications for this test method call for a liquid bath medium. Housed in an insulated steel cabinet with chemical-resistant polyurethane enamel finish. Includes lids for pressure vessel ports. Order thermometer separately.

### Oxidation Stability of Fuels, Solid Block Baths

Insulated aluminum block baths available in two or four-unit capacity. Baths feature microprocessor temperature control with built-in over temperature protection and dual LED displays for setpoint and actual temperature values in °C/°F format. The solid block design offers operating advantages over the boiling water bath, and meets temperature control and other requirements of ASTM and related methods. It should be noted, however, that many applicable specifications for this test method call for a liquid bath medium. Housed in an insulated steel cabinet with chemical-resistant polyurethane enamel finish. Includes lids for pressure vessel ports. Order thermometer separately.

*Communications software (RS232, etc.) ramp-to-set and other enhanced features are available as extra cost options.*
*Contact your* EXPOTECH USA *representative for information.*

**Specifications**

Conforms to the specifications of: ASTM D525, D873; IP 40, IP 138; ISO 7536; DIN 51780, 51799; FTM 791-3352, 791-3354; NF M 07-012, 07-013

**Maximum Temperature** 250°F (121°C)

*Solid block baths meet temperature control and other requirements of ASTM and related methods. While the aluminum block design offers operating advantages over the standard boiling water bath, it should be noted that many applicable specifications for this test call for a liquid bath medium. Please refer to the test method for the specific requirements.*



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| Ordering Information | | | | |
|---|---|---|---|---|
| Catalog Number | Capacity | Electrical Requirements | Heater Range | Dimensions lxwxh,in.(cm) |
| **1844039** | 2 vessels | 1115V 50/60Hz, 12A | 0-1300W | 15x10x17 (38x25x43) |
| **1844042** | 2 vessels | 220-240V 50/60Hz, 6A | 0-1300W | 15x10x17 (38x25x43) |
| **1844040** | 4 vessels | 115V 50/60Hz, 22A | 0-2500W | 24x10x17 (61x25x43) |
| **1844043** | 4 vessels | 220-240V 50/60Hz, 11A | 0-2500W | 24x10x17 (61x25x43) |

| Accessories | |
|---|---|
| Catalog Number | Product Description |
| **2024303** | Glass Sample Container and Cover with pour out spout |
| **1186775** | Gasket. Replacement composition gasket for 1844044 Oxidation Pressure Vessel. |
| **2024304** | Pressure Line. For pressurizing Oxidation Pressure Vessel. 6 ft. (1.83m) long, with quick release coupling for needle valve on pressure vessel and threaded fitting for oxygen tank. |
| **2024306** | Oxygen Manifold Pressure Relief System connects to oxygen source to prevent overcharging of vessel. Equipped with relief valve to vent at 125psi and 300 series stainless steel 150psi burst disk assembly. Constructed from 300 series stainless steel. Cleaned for oxygen service. |
| **1340197** | Wrench. For tightening seal on Oxidation Pressure Vessel. |
| **1340198** | Table Socket. Installs in benchtop to aid in tightening seal on Oxidation Pressure Vessel. |
| **1186777** | Bronze Tubing. For connecting pressure recorder to vessel. Flexible seamless helical tubing with protective armor braid and connections. 5 ft (1.52m) long. |
| **2024305** | Burst Disk Assembly. Retrofit kit for Oxidation Pressure Vessel without burst disk assembly. |
| **1394492** | ASTM 22F Thermometer. Range: 204 to 218°F |
| **1394491** | ASTM 22C Thermometer. Range: 95 to 103°C |

## Oxidation Pressure Vessel

### Test Method

Provides an indication of the tendency of gasoline and aviation fuels to form gum in storage. The sample is oxidized inside a stainless steel pressure vessel initially charged with oxygen at 100psi (689kPa) and heated in a bath. The amount of time required for a specified drop in pressure (gasoline) or the amount of gum and precipitate formed after a specific aging period (aviation fuels) is determined.

### Features and Benefits

- Conforms to ASTM D525, D873, ISO 7536 and related specifications
- Oxidation pressure vessel incorporates burst disk assembly
- Oxidata™ Pressure Measurement System
- Available in two, four, or six-unit configurations
- Choice of water or solid block heating baths

| Ordering Information | |
|---|---|
| Catalog Number | Product Description - Cloud and Pour Point Chamber |
| **1844044** | Oxidation pressure vessel |

## Oxidation Pressure Vessel

Precision machined stainless steel pressure vessel includes threaded body; lid; stem with filler rod and mounting flange; needle valve for purging, pressurizing and exhausting pressure vessel with oxygen; and burst disk assembly. Pressure vessel interior and inside of stem have a high polish to facilitate cleaning and prevent corrosion. Stainless steel burst disk ruptures at 223psi (1537kPa) to prevent unsafe pressure build-up inside pressure vessel. Octagonal sections on the pressure vessel and lid permit tight closure with wrench. Includes buna-N gaskets. Can also be used as a pressure vessel in ASTM D5304 “Standard Test Method for Assessing Distillate Fuel Storage Stability by Oxygen Overpressure”.

**Specifications**

Conforms to the specifications of: ASTM D525, D873; IP 40, IP 138; ISO 7536; DIN 51780, 51799; FTM 791-3352, 791-3354; NF M 07-012, 07-013

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2024303** | Glass Sample Container and Cover with pour out spout |
| **1186775** | Gasket. Replacement composition gasket for 1844044 Oxidation Pressure Vessel. |
| **2024304** | Pressure Line. For pressurizing Oxidation Pressure Vessel. 6 ft. (1.83m) long, with quick release coupling for needle valve on pressure vessel and threaded fitting for oxygen tank. |
| **2024306** | Oxygen Manifold Pressure Relief System.Connects to oxygen source to prevent overcharging of vessel. Equipped with relief valve to vent at 125psi and 300 series stainless steel 150psi burst disk assembly. Constructed from 300 series stainless steel. Cleaned for oxygen service. |
| **1340197** | Wrench. For tightening seal on Oxidation Pressure Vessel. |
| **1340198** | Table Socket. Installs in benchtop to aid in tightening seal on Oxidation Pressure Vessel. |
| **1186777** | Bronze Tubing. For connecting pressure recorder to vessel. Flexible seamless helical tubing with protective armor braid and connections. 5 ft (1.52m) long. |
| **2024305** | Burst Disk Assembly. Retrofit kit for Oxidation Pressure Vessel without burst disk assembly. |

## Oxidata™ Data Acquisition Software Package

### Features and Benefits

- Electronic pressure measurement systems exclusively designed for ASTM oxidation test methods
- Automatic end-point detection
- Powerful Oxidata™ for Windows® environments
- Monitors up to twelve pressure and four temperature channels
- Real-time average bath temperature display
- *Can be installed to most manufacturer’s fuel oxidation test apparatus*

## Oxidata™ Data Acquisition Software Package

Complete electronic measurement systems for plotting pressure versus time and temperature in oxidation testing of fuels. Each system includes transducers, multiplexer, data acquisition card, software, and mounting Each system includes transducers, multiplexer, data acquisition card, software, and mounting and connecting hardware. Systems are available in two, three and four pressure vessel configurations, and additional channels can be added for up to a total of twelve pressure and four temperature channels.

Pressure measurement systems for fuels oxidation testing features Oxidata™, a high accuracy pressure measurement software package designed exclusively for ASTM oxidation test methods. Designed to run in a Windows® 2000 or Windows XP environment, Oxidata™ monitors up to twelve samples simultaneously, with graphical or tabular display of results. Each channel can be independently configured for any of the applicable ASTM standard test methods without compromising the independence or accuracy of the other channels. Independent start and stop times and user programmable end points add even greater flexibility.

The software plots your data on line, real time, and automatically saves your data on disk or to the hard drive during the test to prevent loss of valuable data. Multiple display options include the ability to view the status of all twelve pressure channels on screen simultaneously and then click on any one channel for a graph display; or to view four channels in graphical format simultaneously. Powerful program features allow you to change axes, have colored plot lines and zoom in on a specific plot sector to view data in greater detail.

## Oxidata™ Features and Specifications

- On line, real-time monitoring of up to twelve samples simultaneously-results plot directly to the screen for instant monitoring or printout of results
- Automatic detection and reporting of break point and induction period
- Invalid test indication when a pressure leak is detected
- Menu options for fuels oxidation testing and other ASTM oxidation tests
- Programmable automatic end-point detection with graphical and tabular representation
- Each channel can be independently configured and operated with different start/stop times and ASTM test methods
- Zoom in feature allows for magnification of any plot area on any channel for a more detailed study
- Monitors and reports temperatures of as many as twelve pressure vessels simultaneously using accessory RTD's, and calculates and displays average temperature for each bath
- Exports data to spreadsheet programs such as Microsoft Excel®, Lotus 1-2-3® etc.
- Temperature and pressure calibration capability
- Data is saved directly to the disk or hard drive during testing to prevent loss of valuable data
- Operates in Windows® 2000 and XP environments

**Included Accessories** (for the pressure measurement systems)
Transducers (connects directly to pressure vessel)
USB interface
Multiplexer
Oxidata™ software
RTD probe assembly (1)
Connecting cables and hardware

**Computer Requirements**
Processor: Intel® Pentium II or similar (minimum)
Memory (RAM): 256Mb or higher
Speed: 500 MHz or higher
Windows® 2000 or higher

Disk Space: 15 Mb free space (minimum)
Communications Port: One USB Port
Other Software: Microsoft® Excel (97 or above)
One RS232 port for temperature controller (optional)

**Ordering Information**

| Catalog Number | Model | Product Description | Electrical Requirements |
|---|---|---|---|
| **1844045** | 2-Unit System | Oxidata™ Pressure Measurement System Windows® XP version for Fuels Oxidation | 115V 60Hz |
| **1844049** | 2-Unit System | Oxidata™ Pressure Measurement System Windows® XP version for Fuels Oxidation | 220-240V 50/60Hz |
| **1844046** | 4-Unit System | Oxidata™ Pressure Measurement System Windows® XP version for Fuels Oxidation | 115V 60Hz |
| **1844050** | 4-Unit System | Oxidata™ Pressure Measurement System Windows® XP version for Fuels Oxidation | 220-240V 50/60Hz |
| **1844047** | 6-Unit System | Oxidata™ Pressure Measurement System Windows® XP version for Fuels Oxidation | 115V 60Hz |
| **1844051** | 6-Unit System | Oxidata™ Pressure Measurement System Windows® XP version for Fuels Oxidation | 220-240V 50/60Hz |

*To upgrade existing Windows® 95/98-based Oxidata™ systems to Version 7.2 for Windows® XP, order a USB upgrade kit. The kit includes a USB port communication box, Oxidata™ software CD, and computer cables. Does not include pressure tranducers with the upgrade kit.*

**Ordering Information**

| Catalog Number | Model | Product Description | Electrical Requirements |
|---|---|---|---|
| **2036644** | 2-Unit System | Oxidata™ Pressure Measurement System Upgrade from Windows® 95/98 to XP for Fuels Oxidation | 115V 60Hz |
| **2038059** | 2-Unit System | Oxidata™ Pressure Measurement System Upgrade from Windows® 95/98 to XP for Fuels Oxidation | 220-240V 50/60Hz |
| **2036660** | 4-Unit System | Oxidata™ Pressure Measurement System Upgrade from Windows® 95/98 to XP for Fuels Oxidation | 115V 60Hz |
| **2035579** | 4-Unit System | Oxidata™ Pressure Measurement System Upgrade from Windows® 95/98 to XP for Fuels Oxidation | 220-240V 50/60Hz |
| **2035122** | 6-Unit System | Oxidata™ Pressure Measurement System Upgrade from Windows® 95/98 to XP for Fuels Oxidation | 115V 60Hz |
| **2036932** | 6-Unit System | Oxidata™ Pressure Measurement System Upgrade from Windows® 95/98 to XP for Fuels Oxidation | 220-240V 50/60Hz |

*To upgrade existing Windows® DOS-based Oxidata™ systems to Version 7.2 for Windows® XP, order a retrofit kit. The kit includes a data acquisition box with USB port connector, Oxidata™ software CD, and computer cables. Does not include pressure transducers with the retrofit kit.*

**Ordering Information**

| Catalog Number | Model | Product Description | Electrical Requirements |
|---|---|---|---|
| **2035512** | 2-Unit System | Oxidata™ Pressure Measurement System Retrofit from Windows® DOS to XP for Fuels Oxidation | 115V 60Hz |
| **2037827** | 2-Unit System | Oxidata™ Pressure Measurement System Retrofit from Windows® DOS to XP for Fuels Oxidation | 220-240V 50/60Hz |
| **2038083** | 4-Unit System | Oxidata™ Pressure Measurement System Retrofit from Windows® DOS to XP for Fuels Oxidation | 115V 60Hz |
| **2038133** | 4-Unit System | Oxidata™ Pressure Measurement System Retrofit from Windows® DOS to XP for Fuels Oxidation | 220-240V 50/60Hz |
| **2035806** | 6-Unit System | Oxidata™ Pressure Measurement System Retrofit from Windows® DOS to XP for Fuels Oxidation | 115V 60Hz |
| **2037531** | 6-Unit System | Oxidata™ Pressure Measurement System Retrofit from Windows® DOS to XP for Fuels Oxidation | 220-240V 50/60Hz |

**Accessories**

| Catalog Number | Product Description - Cloud and Pour Point Chamber |
|---|---|
| **1795075** | Transducer |
| **2038197** | RTD Kit. For monitoring the temperature of an additional bath. |

# Fuel Storage Stability Vessel for ASTM D525

## Test Method

Used for assessing potential storage stability of middle distillate fuels, including fuels with or without stabilizer additives, and freshly refined or previously stored fuels. The sample is aged in a pressurized vessel at constant temperature for 16 hours and, after cooling, the total amount of insoluble products is determined gravimetrically.

## Features and Benefits

- Conforms to the specification of ASTM D5304
- Four unit and six unit models

## Fuel Storage Stability Vessel

Stainless steel pressure vessels accommodate multiple sample containers for determining storage stability of fuels by the oxygen overpressure method. Vessels meet all applicable ASME and ASTM safety requirements for construction and working pressure and maximum operating temperature and are equipped with pressure safety valves factory present at 200psi (1,332kpa). Included with each model are a collapsible glassware rack that installs and removes easily for cleaning, oxygen inlet and outlet valves with quick disconnect fittings and charging hose, pressure gauge and wide-mouth closure with viton O-ring seal.

### Specifications

Conforms to: ASTM D5304
Capacity: Four or six sample containers
Construction: 316 stainless steel, in accordance with ASME specifications
Working Pressure at 90°C: Exceeds ASTM requirements
Safety Relief Valve Setting: 200psi (1,332kPa)
Pressure Gauge: 0-200psi

### Included Accessories

Glassware rack, hinged, for four or six sample containers
Charging Hole with pressure tight crimp and quick disconnect

### Dimensions

2038302: 8.5” high by 9.5” round
Net Weight: 14 lbs (6.4kg)
1158421: 15.5” high by 9.5” round
Net Weight: 17 lbs (8kg)

### Shipping Information

2038302: Shipping Weight: 17 lbs (8kg)
Dimensions: 2.6 Cu. Ft.
1158421: Shipping Weight: 22 lbs (10kg)
Dimensions: 3.5 Cu. Ft.

### Ordering Information

| Catalog Number | Product Description |
|---|---|
| **2038302** | Fuel Storage Stability Vessel, 4 Unit |
| **1158421** | Fuel Storage Stability Vessel, 6 Unit |

### Accessories

| Catalog Number | Product Description |
|---|---|
| **2024303** | Glass Sample Container with Cover |



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# Existent Gum Evaporation Bath & Data Acquisition Software

## Test Method

Gum formed during fuel storage can deposit on induction system surfaces, intake valves, stems and guides. To test for gum content, a 50mL sample is evaporated in an aluminum block bath for a specified period under controlled conditions of temperature and flow of air (aviation and motor gasolines) or steam (aircraft turbine fuel).

## Features and Benefits

- Conforming to ASTM D381 and related specifications
- Choice of three-unit and six-unit models
- Available with built-in steam superheater
- Microprocessor programmable high accuracy temperature control
- Built-in pressure regulators and air flowmeters

## Existent Gum Evaporation Bath

Evaporates aircraft turbine fuel and motor and aviation gasoline samples under controlled conditions in accordance with ASTM specifications. Consists of a high temperature evaporation bath with 100mL test beakers and, for aircraft turbine fuels, a steam generator and steam superheater. Electrically heated baths for determining existent gum in aircraft turbine fuels by steam-jet evaporation and in motor and aviation gasolines by air-jet evaporation. Fully insulated, aluminum block design assures safe, efficient high temperature operation. Equipped with air/steam pressure regulator with gauge and a flowmeter for adjusting air flow per ASTM specifications. Stainless steel jets deliver air or steam flow to the test wells through removable brass conical adapters. Microprocessor PID control provides quick temperature stabilization without overshoot, and the bath is protected by an over temperature control circuit that interrupts power should bath temperature exceed a programmed cut-off point. Dual LED displays provide actual and setpoint temperature values in °C/°F format.

*Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options.*
*Contact your* EXPOTECH USA *representative for information.*

**Model 1340121 with Built-in Superheater**–Six-unit bath with a built-in thermostatically controlled superheater which delivers dried steam to the bath inlet for steam-jet method testing of aircraft turbine fuels. Has digital-indicating solid state bath temperature control with digital setpoint and display

**Model 1844115–Six-unit bath without built-in superheater**. Controls are housed in a separate cabinet connected to the bath by multi-conductor cable.

**Model 1865156**–Three-unit bath without built-in superheater. All controls are housed in the bath cabinet.

### Specifications
Conforms to the specifications of: ASTM D381; IP 131; ISO 6246; DIN 51784; FTM 791-3302; NF M 07-004

### Testing Capacity
1340121 and 1844115: 6 sample beakers
1865156 and 1795668: 3 sample beakers

### Maximum Temperature
475°F (246°C)

### Temperature Control Stability
±1°F (±0.5°C)

### Bath Configuration
Machined aluminum block with multiple cartridge heaters

### Heater Range
1340121 and 1844115: 0-3000W
1865156 and 1795668: 0-1500W

### Superheater (Model 1340121 only)
Superheating chamber and condensate trap constructed of stainless steel solid state thermoregulator (0-550°F) with heater range of 0-1500W

### Electrical Requirements
1844115: 220-240V, 50/60Hz, Single Phase, 13.6A
1340121: 220-240V, 50/60Hz, Single Phase, 20.4A
1865156: 115V, 50/60Hz, Single Phase, 13.0A
1795668: 220-240V, 50/60Hz, Single Phase, 6.8A

### Included Accessories
Conical Brass Adapters for air/steam jets



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**Dimensions** lxwxh,in.(cm)

1340121: 32.5x20x20 (83x51x51)
1865156: 32.5x11x19 (83x28x48)
1844115: Bath: 28x20x16 (71x51x41) Control Cabinet: 9x8x6.5 (23x20x17)
Net Weight:
1340121: 230 lbs (104.3kg)
1865156: 85 lbs (38.6kg)
1844115: 203 lbs (92.1kg)

**Shipping Information**

1340121: Shipping Weight: 313 lbs (142kg)
Dimensions: 17.2 Cu. ft.
1865156: Shipping Weight: 140 lbs (63.5kg)
Dimensions: 8.3 Cu. ft.
1844115: Shipping Weight: 271 lbs (123kg)
Dimensions: 13.7 Cu. ft.

## Existent Gum Software

Existent Gum Software retrieves temperature data in real-time and performs data analysis for up to 6 samples at one time. The data analysis also includes accounting for the tare beaker as well as calculations for residue and gum content for both washed and unwashed gums. Analytical balance eliminates weighing errors by recording values directly from the balance with a simple click of the mouse. The sophisticated Windows®-based software package features an easy-to-navigate operation, a straightforward user interface, minimal draw on Windows® memory resources, automatic real-time data acquisition via RS232 connection, and a timer / stopwatch feature for general laboratory use. The "test intelligent" software simplifies the testing process by providing sequential test prompts for assisting the operator with each step of the test procedure. The active zoom, pan, and trace feature allows the ability to change axes and the magnification of any sector of the pressure or temperature graphs to view data in greater detail. The final test data is exported with graphs and test parameters either directly to Microsoft® Excel, in ASCII file format for use with LIMS or any other spreadsheet programs, or directly to a printer with a test report according to ISO guidelines. Test data is saved in a database format for determining test averages, standard deviations, and ASTM test repeatability for aviation turbine fuels, aviation gasolines, motor gasolines washed and unwashed. The software package requires no PC hardware installation and includes the software installation CD and computer connection cables.

**Computer Requirements**

Processor: Intel® Pentium II or similar (minimum)
Memory (RAM): 256Mb or higher
Speed: 500 MHz or higher
Windows® 2000 or higher
Disk Space: 15 Mb free space (minimum)
Communications Port: One USB Port
Other Software: Microsoft® Excel (97 or above)
One or two RS232 ports for temperature controller

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **1340121** | Existent Gum Evaporation Bath, 6-Unit with Superheater | 220-240V 50/60Hz |
| **1844115** | Existent Gum Evaporation Bath, 6-Unit | 220-240V 50/60Hz |
| **1865156** | Existent Gum Evaporation Bath, 3-Unit | 115V 50/60Hz |
| **1795668** | Existent Gum Evaporation Bath, 3-Unit | 220-240V 50/60Hz |
| **2253422** | Existent Gum Data Acquisition Software | |

## Existent Gum Steam Generator

### Test Method

Gum formed during fuel storage can deposit on induction system surfaces, intake valves, stems and guides. To test for gum content, a 50mL sample is evaporated in an aluminum block bath for a specified period under controlled conditions of temperature and flow of air (aviation and motor gasolines) or steam (aircraft turbine fuel).

### Features and Benefits

- For steam-jet method testing of aircraft turbine fuels
- Meets output requirements of three-unit and six-unit evaporation baths
- Electrically heated for clean, efficient operation and ease of installation
- Meets applicable ASME, NEC standards; UL listed, CSA approved

## Existent Gum Steam Generator

Electrically heated boiler provides instantaneous and reserve steam capacity for steam-jet evaporation tests. Easy to install and operate; electrical heating eliminates the need for on-site fuel combustion. Requires only a water feed source and electrical hook-up. Ruggedly constructed, with long life industrial grade incoloy heating element. Includes a full range of safety features: automatic water level control and low water cut-off; steam safety valve; high-limit pressure cut-out with manual reset; steam pressure gauge.

**Specifications**
Output: 54.1 lbs steam/hr. 212°F
Bhp Rating: 1.83
kW Rating: 18

**Dimensions** lxwxh,in.(cm)
20x28x36 (51x71x91)
Net Weight: 185 lbs (83kg)

**Shipping Information**
Shipping Weight: 200 lbs (91kg)
Dimensions: 18 Cu. ft.

### Ordering Information

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2036805** | Steam Boiler | 208V 60Hz, Single Phase, 87A |
| **2035380** | Steam Boiler | 208V 60Hz, Three Phase, 50A |
| **2035257** | Steam Boiler | 240V 60Hz, Single Phase, 75A |
| **2038191** | Steam Boiler | 240V 60Hz, Three Phase, 43A |
| **2035889** | Steam Boiler | 380V 50/60Hz, Three Phase, 27A |
| **2035334** | Steam Boiler | 415V 50Hz, Three Phase, 25A |
| **2288451** | Steam Boiler | 480V 60Hz, Three Phase, 22A |

### Accessories

| Catalog Number | Product Description |
|---|---|
| **2036051** | **Steam Superheater** Provides dry superheated steam for evaporation baths not equipped with a built-in superheater. Use together with an outside steam source for steam-jet method testing of aircraft turbine fuels. Superheating chamber and condensate trap are constructed entirely of stainless steel. Solid state temperature controller adjusts between 0-550°F. Equipped with steam inlet and outlet connections and condensate drain valve. Steel exterior has a chemical resistant polyurethane enamel finish.<br>Dimensions 5x27x9½" (13x70x24cm).<br>Shipping Weight: 23 lbs (10.4kg)<br>220-240V 50/60Hz, Single Phase, 6.8A |
| **2038167** | Sample Beaker, 100mL spun copper, 50x78mm |
| **2037432** | Sample Beaker, Pyrex™, 100mL |
| **2037303** | ASTM 3F Thermometer. Range: 20 to 760°F |
| **2036325** | ASTM 3C Thermometer. Range: –5 to +400°C |



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# Dew Point Apparatus

## Test Method

Determines the water vapor content of gaseous fuels by measurement of the dew point temperature, followed by calculation of the water vapor content.

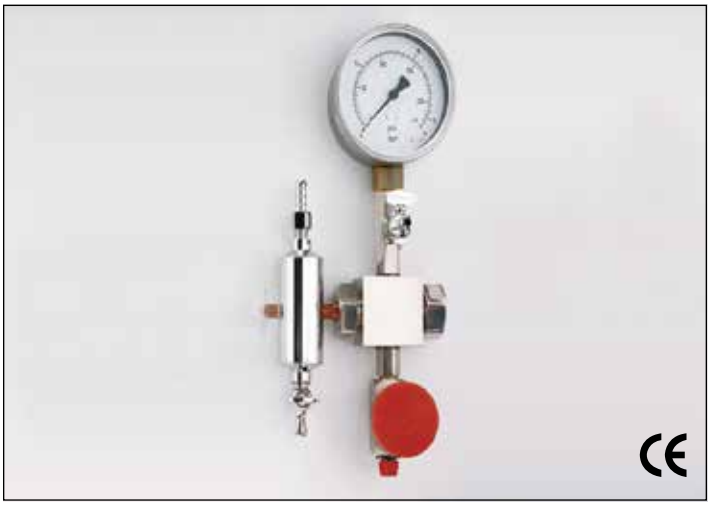
## Features and Benefits

- Rugged construction
- Stainless steel sample chamber with incorporated “target mirror”

## Dew Point Apparatus

The Dew Point Apparatus consists of a closed stainless steel dew point chamber containing a highly polished stainless steel “target mirror” and sample inlet and outlet control valves. The chamber is chilled by refrigerant following through the outer cooling jacket, preventing any refrigerant contact with the test sample. The thermometer is inserted into the mirror support structure, providing the temperature of the “target mirror.” As the sample flows in the chamber and is deflected across the surface of the mirror, the temperature at which condensation collects on the mirror is recorded as the dew point of the sample.

**Specifications**
Conforms to the specifications of:
ASTM D1142; GPA



**Dimensions** lxwxh,in.(cm)
3.5x6x12.75 (9x15x32.5)
Net Weight: 6.5 lbs (3kg)

**Shipping Information**
Shipping Weight: 11 lbs (5kg)
Dimensions: 2.5 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description |
|---|---|
| **2052737** | Dew Point Apparatus |

**Accessories**

| Catalog Number | Product Description | Range |
|---|---|---|
| **2052738** | Pressure Gauge | 0 to 230 psi |
| **2251975** | Pressure Gauge | 0 to 2300 psi |
| **1797869** | ASTM 33F Thermometer | –36.5 to +107.5°F |
| **1797870** | ASTM 33C Thermometer | –38 to +42°C |
| **2303502** | ASTM 114F Thermometer | –112 to +70°F |
| **2037197** | ASTM 114C Thermometer | –80 to +20°C |

# LPG Copper Strip Corrosion Test Water Bath

## Test Method

Tests the corrosiveness of LPG to copper by immersion of a polished test strip in the sample inside a test cylinder at elevated temperature. After one hour the test strip is removed and compared against the ASTM Copper Strip Corrosion Standards. Complete test consists of LPG Corrosion Test Cylinders, Water Bath, Copper Strips, Polishing Materials and the ASTM Copper Strip Corrosion Test Standards.

## Features and Benefits

- Conforms to ASTM D1838 and related specifications
- Four-sample testing capability

## LPG Copper Strip Corrosion Test Water Bath

Thermostatically controlled water bath submerges four LPG Corrosion Test Cylinders in an upright position. Controls temperature at 100±1°F (37.8±0.5°C) per ASTM specifications. Soxhlet reflux condenser and constant water level device maintain proper working depth. Polished stainless steel double-wall construction. Fully insulated.

**Specifications**
Conforms to the specifications of:
ASTM D1838; GPA 2140; ISO 6251
Capacity: four (4) LPG Corrosion Test Cylinders
Maximum Temperature: 221°F (105°C)
Temperature Control Stability: ±1°F (±0.5°C)
Heater Range: 0-750W
Bath Medium: 3.8 gal (14.4L) Water

**Electrical Requirements**
115V 50/60Hz, Single Phase, 6.5A
220-240V 50/60Hz, Single Phase, 3.4A

**Dimensions** lxwxh,in.(cm)
12x10x24 (30x25x61)
Net Weight: 19 lbs (8.6kg)

**Shipping Information**
Shipping Weight: 27 lbs (12.2kg)
Dimensions: 5.3 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **1186708** | LPG Corrosion Test Water Bath | 115V 50/60Hz |
| **1844118** | LPG Corrosion Test Water Bath | 220-240V 50/60Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **1186711** | Copper Strip for LPG. 12.5x1.5-3.0x75mm with 3.2mm hole per ASTM specifications |
| **2024685** | Connecting Tubing. Sulfur-free plastic-lined tubing for connection of test cylinder valve to sample source. With 1/4" stainless steel and aluminum connectors. 24" long |
| **1186692** | ASTM Copper Strip Corrosion Test Standards. Colored reproductions of tarnished strips encased in a plastic plaque. |
| **1790863** | Silicone Carbide Paper, 240-grit. For polishing copper strips prior to testing. Pack of 50 sheets. |



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| Catalog Number | Product Description |
|---|---|
| **1790864** | Silicone Carbide Grain, 150-grit. For final polishing of copper strips prior totesting. 1 lb package. |
| **2024686** | Polishing Vise. Holds copper strip firmly in place without marring the edges. Stainless steel, mounted on a composition base. |
| **1340233** | Multi-Strip Polishing Vise. Similar to 2024686 but capable of holding four strips at a time. |
| **2037926** | ASTM 12F Thermometer. Range: –5 to +215°F |
| **1793023** | ASTM 12C Thermometer. Range: –20 to +102°C |
| **2036069** | Silicone Carbide Paper, 150-grit for polishing copper strips prior to testing. Pack of 50 sheets |

## LPG Copper Strip Corrosion Test Cylinder

### Test Method

Tests the corrosiveness of LPG to copper by immersion of a polished test strip in the sample inside a test cylinder at elevated temperature. After one hour the test strip is removed and compared against the ASTM Copper Strip Corrosion Standards. Complete test consists of LPG Corrosion Test Cylinders, Water Bath, Copper Strips, Polishing Materials and the ASTM Copper Strip Corrosion Test Standards.

### Features and Benefits

• Conforms to ASTM D1838 and related specifications

### LPG Copper Strip Corrosion Test Cylinder

Stainless steel cylinder with 1/4” needle valves for purging and admitting LPG samples. Dip tube with hook suspends copper strip in sample. Knurled, threaded cap with O-ring gasket hand tightens to a positive seal. Withstands hydrostatic test pressure of 1000 psig (6895kPa).

**Specifications**
Conforms to the specifications of:
ASTM D1838; GPA 2140; ISO 6251

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **1186711** | Copper Strip for LPG. 12.5x1.5-3.0x75mm with 3.2mm hole per ASTM specifications |
| **2024685** | Connecting Tubing. Sulfur-free plastic-lined tubing for connection of test cylinder valve to sample source. With 1/4” stainless steel and aluminum connectors. 24” long |
| **1186692** | ASTM Copper Strip Corrosion Test Standards. Colored reproductions of tarnished strips encased in a plastic plaque. |
| **1790863** | Silicone Carbide Paper, 240-grit. For polishing copper strips prior to testing. Pack of 50 sheets. |
| **1790864** | Silicone Carbide Grain, 150-grit. For final polishing of copper strips prior totesting. 1 lb package. |
| **2024686** | Polishing Vise. Holds copper strip firmly in place without marring the edges. Stainless steel, mounted on a composition base. |

| Catalog Number | Product Description |
|---|---|
| **1340233** | Multi-Strip Polishing Vise. Similar to 2024686 but capable of holding four strips at a time. |
| **2037926** | ASTM 12F Thermometer. Range: –5 to +215°F |
| **1793023** | ASTM 12C Thermometer. Range: –20 to +102°C |
| **2036069** | Silicone Carbide Paper, 150-grit for polishing copper strips prior to testing. Pack of 50 sheets |

**Ordering Information**

| Catalog Number | Product Description |
|---|---|
| **1186709** | LPG Copper Strip Corrosion Test Cylinder |

## Copper Strip Corrosion Test Bomb Bath

### Test Method

The Copper Strip Tarnish Test assesses the relative degree of corrosivity of petroleum products, including aviation fuels, automotive gasoline, natural gasoline, solvents, kerosene, diesel fuel, distillate fuel oil, lubricating oil and other products. A polished copper strip is immersed in 30mL of sample at elevated temperature. After the test period, the strip is examined for evidence of corrosion and a classification number from 1-4 is assigned based on a comparison with the ASTM Copper Strip Corrosion Standards. For aviation fuels and natural gasoline the sample tube is placed inside a stainless steel bomb during testing.

### Features and Benefits

• Conforms to ASTM D130 and related test specifications

### Copper Strip Corrosion Test Bomb Bath

Thermostatically controlled water bath immerses Copper Strip Corrosion Test Bombs at the required depth per ASTM specifications. Use for testing aviation gasoline, aviation turbine fuel and natural gasoline. Fully insulated, double-wall stainless steel construction. Soxhlet reflux condenser and constant water level device maintain proper working depth. Choice of four-bomb and eight-bomb models. Optional removable test tube rack converts four-bomb model for testing of products not requiring corrosion bomb.

**Specifications**

Conforms to the specifications of: ASTM D130; IP 154 FSPT DT-28-65; ISO 2160; DIN 51759; FTM 791-5325; NF M 07-015
Testing Capacity
1408113/2035184: four (4) copper strip corrosion test bombs
1408114/2038074*: eight (8) copper strip corrosion test bombs
**or sixteen (16) test tubes with 2038281 optional test rack installed*

Maximum Temperature: 221°F (105°C)
Temperature Control Stability: ±1°F (± 0.5°C)
Heater Range: 0-750W
Bath Medium: 5 gal (18.9L) water
Temperature Control: Analog

**Electrical Requirements**
115V 60Hz, Single Phase, 7.5A
220-240V 50/60Hz, Single Phase, 4A

**Included Accessories**
Rubber Stoppers for bomb openings (4)

**Dimensions** lxwxh,in.(cm)
4-bomb model: 12x10x21 (30x25x53)
8-bomb model: 16x11.5x21 (41x29x54)

Net Weight:
4-bomb model: 18.5 lbs (8.4kg)
8-bomb model: 24 lbs (10.9kg)

**Shipping Information**
Shipping Weight:
4-bomb model: 41 lbs (18.6kg)
8-bomb model: 45 lbs (20.4kg)
Dimensions:
4-bomb model: 5.3 Cu. ft.
8-bomb model: 5.5 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **1408113** | Bath for Copper Strip Corrosion Test Bombs, 4-Unit | 115V 50/60Hz |
| **2035184** | Bath for Copper Strip Corrosion Test Bombs, 4-Unit | 220-240V 50/60Hz |
| **1408114** | Bath for Copper Strip Corrosion Test Bombs, 8-Unit | 115V 50/60Hz |
| **2038074** | Bath for Copper Strip Corrosion Test Bombs, 8-Unit | 220-240V 50/60Hz |
| **2038281** | Optional Test Tube Rack for 8-Bomb Bath | |

## Copper Strip Corrosion Test Bomb

### Test Method

The Copper Strip Tarnish Test assesses the relative degree of corrosivity of petroleum products, including aviation fuels, automotive gasoline, natural gasoline, solvents, kerosene, diesel fuel, distillate fuel oil, lubricating oil and other products. A polished copper strip is immersed in 30mL of sample at elevated temperature. After the test period, the strip is examined for evidence of corrosion and a classification number from 1-4 is assigned based on a comparison with the ASTM Copper Strip Corrosion Standards. For aviation fuels and natural gasoline the sample tube is placed inside a stainless steel bomb during testing.

### Features and Benefits

- Conforms to ASTM D130 and related test specifications
- For aviation fuels and natural gasoline

### Copper Strip Corrosion Test Bomb

Precision machined stainless steel bomb inserts in copper corrosion bath for testing aviation fuels and natural gasoline. Withstands test pressure of 100psi (689kPa) per specifications. Threaded cap with O-ring gasket and knurled circumference tightens by hand to a positive seal. A 1/8 groove in the bomb threads permits safe, gradual release of pressure when opening the bomb.



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**Specifications**
Conforms to the specifications of:
ASTM D130, D6074, D6158; IP 154; ISO 2160; DIN 51759;
FTM 791-5325;

NF M 07-015
Net Weight: 1 lb (0.45kg)

**Shipping Information**
Shipping Weight: 2 lbs (0.91kg)

**Ordering Information**

| Catalog Number | Product Description |
|---|---|
| **1186693** | Copper Strip Corrosion Test Bomb |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **1186691** | Copper Test Strip. 12.5 x 1.5-3.0mm x 75mm to ASTM specifications |
| **1790861** | Test Tube, 25 x 150mm |
| **2023470** | Viewing Test Tube. Protects copper strip during inspection or storage. |
| **1186692** | ASTM Copper Strip Corrosion Standards. Colored reproductions of tarnished strips encased in a plastic plaque |
| **2036069** | Silicone Carbide Paper, 150-grit. For polishing of copper strips prior to testing. Pack of 50 sheets. |
| **1790863** | Silicone Carbide Paper, 240-grit. For polishing of copper strips prior to testing. Pack of 50 sheets. |
| **1790864** | Silicone Carbide Grain, 150-grit. For polishing of copper strips prior to testing. 1 lb package. |
| **2024686** | Polishing Vise Holds copper strip firmly in place without marring the edges. Stainless steel, mounted on a composition base. |
| **1340233** | Multi-Strip Polishing Vise. Similar to 2024686 but capable of holding four strips at a time. |
| **2037926** | ASTM 12F Thermometer. Range: –5 to +215°F |
| **1793023** | ASTM 12C Thermometer. Range: –20 to +102°C |

## Copper Strip Corrosion Test Tube Bath

### Test Method

The Copper Strip Tarnish Test assesses the relative degree of corrosivity of petroleum products, including aviation fuels, automotive gasoline, natural gasoline, solvents, kerosene, diesel fuel, distillate fuel oil, lubricating oil and other products. A polished copper strip is immersed in 30mL of sample at elevated temperature. After the test period, the strip is examined for evidence of corrosion and a classification number from 1-4 is assigned based on a comparison with the ASTM Copper Strip Corrosion Standards. For aviation fuels and natural gasoline the sample tube is placed inside a stainless steel bomb during testing.

### Features and Benefits

• Conforms to ASTM D130 and related test specifications



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## Copper Strip Corrosion Test Tube Bath

Constant temperature bath immerses 16 test tubes for copper strip tarnish tests of products not requiring a test bomb, including: diesel fuel, fuel oil, automotive gasoline, Stoddard solvent, kerosene and lubricating oil. Microprocessor temperature controller has °C/°F switchable digital setpoint and display. Operator and equipment are protected by an over temperature control circuit which automatically interrupts power to the unit should bath temperature exceed a programmed cut-off point. Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Contact your EXPOTECH USA representative for information. Welded stainless steel double-wall construction with built-in support rack. Fully insulated.

**Specifications**
Conforms to the specifications of:
ASTM D130, D6074, D6158; FSPT DT-28-65; IP 154; ISO 2160; DIN 51759; FTM 791-5325; NF M 07-015

Capacity: 16 test tubes
Maximum Temperature: 190°C (374°F)
Temperature Control Stability: ±1°C (±2°F)
Heater Range: 0-750W
Bath Medium: 5 gal (18.9L) water or high temperature heater transfer fluid
Temperature Control: Digital

**Electrical Requirements**
115V 50/60Hz, Single Phase, 7.5A
220-240V 50/60Hz, Single Phase, 4A

**Dimensions** lxwxh,in.(cm)
15.5x12.5x14 (39x32x36)
Net Weight: 27 lbs (12.2kg)

**Shipping Information**
Shipping Weight: 45 lbs (20.4kg)
Dimensions: 12.8 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **1408115** | Copper Strip Corrosion Test Tube Bath | 115V 50/60Hz |
| **1844091** | Copper Strip Corrosion Test Tube Bath | 220-240V 50/60Hz |
| **1844090** | Vented Cork (16) | |

## Silver Strip Corrosion Test Tube Bath

### Test Method

Tests the corrosiveness of aviation turbine fuels towards silver. A polished silver strip is immersed in a fuel sample at elevated temperature. After a specified test period, the strip is removed from the sample, washed and evaluated for corrosion

### Features and Benefits

- Conforms to IP 227 specifications
- Six sample capability

### Silver Strip Corrosion Test Tube Bath

Fully insulated, thermostatically controlled water bath with constant water level device. Use together with 2018683 Bath Conversion Kit to immerse six 350mL test tubes for silver strip corrosion tests. Stainless steel inner wall and powder coated steel outer wall construction.

**Specifications**
Conforms to the specifications of:
IP 227; ASTM D130, D6074, D6158; FSPT DT-28-65; IP 154; ISO 2160; DIN 51759; FTM 791-5325; D4814

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Testing Capacity: 6 samples for silver strip corrosion testing
Maximum Temperature: 221°F (105°C)
Temperature Control Stability: ±1°F (±0.5°C)
Heater Range: 0-750W
Bath Medium: 5 gal (18.9L) water
Temperature Control: Analog

**Electrical Requirements**
115V 60Hz, Single Phase, 7.5A
220-240V 50/60Hz, Single Phase, 4A

**Shipping Information**
Shipping Weight: 29 lbs (13.2kg)
Dimensions: 5.3 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **1408113** | Silver Strip Corrosion Test Bath | 115V, 50/60Hz |
| **2035184** | Silver Strip Corrosion Test Bath | 220-240V, 50/60Hz |
| **2018683** | Bath Conversion Kit for IP 227 | |

**Accessories**

| Catalog Number | Product Description | Order Qty |
|---|---|---|
| **2036881** | Glassware Set for IP 227. Includes cold-finger condenser, glass cradle and 350mL test tube | 6 |
| **2018685** | Silver Test Strip. Conforming to IP 227 specifications | 6 |
| **2018686** | ASTM D3241-IP 323 Color Standard | 1 |
| **1793023** | ASTM 12C Thermometer. Range: –20 to +102°C | 1 |
| **2024686** | Polishing Vise. Holds silver strip firmly in place without marring the edges. Stainless steel, mounted on a composition base. | 1 |
| **1790863** | Silicone Carbide Paper, 240-grit. For final polishing of strips prior to testing. Pack of 50 sheets. | 1 |
| **2036069** | Silicone Carbide Paper, 150-grit. For final polishing of strips prior to testing. Pack of 50 sheets. | 1 |
| **1790864** | Silicone Carbide Grain, 150-grit. For polishing ends and sides of strips prior to testing. 1 lb package. | 1 |
| | **Additional Accessories for D4814** | |
| **1186693** | Copper Strip Corrosion Test Bomb | 4 |
| **1790861** | Test Tube | 4 |

## Reid Vapor Pressure Bath, 4-Unit

### Test Method

Vapor pressure is a critical factor in the handling and performance of liquid petroleum and liquefied petroleum gas (LPG) products. The vapor pressure of automotive gasolines is subject to governmental regulation for pollution control purposes.

### Features and Benefits

- Conforms to ASTM D323, D1267 and related specifications
- Free standing or flush-mount benchtop installation
- Microprocessor programmable high accuracy temperature control

## Reid Vapor Pressure Bath, 4-Unit

Constant temperature water baths designed for Reid Vapor Pressure determinations of liquid petroleum products and liquefied petroleum gases (LPG). Immerses vapor pressure apparatus at the proper depth per ASTM specifications. Controls bath temperature with ±0.2°F (±0.1°C) precision. Microprocessor PID control provides quick temperature stabilization without overshoot, and the bath is protected by an over temperature control circuit that interrupts power should bath temperature exceed a programmed cut-off point. Dual LED displays provide actual and setpoint temperature values in °C/°F format. *Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Contact your* EXPOTECH USA *representative for information.* Double-wall construction with fiberglass insulated stainless steel tank. A sturdy 1" (25mm) flange permits flush-mount benchtop installation for easy access to the bath interior. Built-in holders suspend test cylinders at the required depth. Equipped with overflow stand pipe/drain.

*Test apparatus for liquid products (ASTM D323) requires:*
Test Cylinders, one or two-opening type
Pressure Gauges
Constant Temperature Bath
Bath Thermometer
Transfer Connection
Manometer
Manometer Adapter

*Test apparatus for liquefied petroleum gases (ASTM D1267) requires:*
Test Cylinders, two-opening type
Bleeder Valve Assemblies
Pressure Gauges
Constant Temperature Bath
Bath Thermometer
Flexible Tubing

**Specifications**
Conforms to: ASTM D323, D1267; GPA 2140; IP 69, 161; ISO 3007, 4256; DIN 51616, 51754; FTM 791-1201; NF M 07-007, 41-010
Capacity: 1 to 4 vapor pressure apparatus, one-opening or two-opening type
Temperature Control Stability: ±0.2°F (±0.1°C)
Maximum Temperature: 212°F (100°C)
Bath Medium: 13.7gal (51.9L) water

**Electrical Requirements**
115V 50/60Hz, Single Phase, 18.8A
220-240V 50/60Hz, Single Phase, 9.4A
**Dimensions** lxwxh,in.(cm)
15x15x36 (38.1x38.1x91.5)
Net Weight: 67 lbs (30.4kg)
**Shipping Information**
Shipping Weight: 105 lbs (47.7kg)
Dimensions: 14 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **1844052** | Reid Vapor Pressure Bath, 4-Unit | 115V 50/60Hz |
| **1792951** | Reid Vapor Pressure Bath, 4-Unit | 220-240V 50/60Hz |

| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2037974** | ASTM 18F Thermometer. Range: 94 to 108°F |
| **1872714** | ASTM 18C Thermometer. Range: 34 to 42°C |
| **2036515** | ASTM 65F Thermometer. Range: 122 to 176°F |
| **2036809** | ASTM 65C Thermometer. Range: 50 to 80°C |
| **1402001** | Transfer Connection. Consists of threaded brass cup, delivery tube, and sampling tube. Use for removing liquid from the sample container in accordance with ASTM specifications. |
| **2019686** | Mercury Manometer Graduated in cm (1mm div.) and inches (0.1" div.). For checking pressure gauge reading up to 15psi. |
| **2019687** | Manometer Adapter. Attaches to pressure gauge for checking with mercury manometer |
| **1865178** | O-Ring Seal. For coupling between air and gas chambers on 1186778 and 1340200 vapor pressure bombs. |
| **1865177** | O-Ring Seal. For gauge and bleeder valve assembly connections on 1186778 and 1340200 vapor pressure bombs. |
| **2024685** | Flexible Tubing. Sulfur-free plastic lined tubing with 1/4" stainless steel and aluminum connectors. For charging LPG test cylinder. |

## Reid Vapor Pressure Bath, 21-Unit

### Test Method

Vapor pressure is a critical factor in the handling and performance of liquid petroleum and liquefied petroleum gas (LPG) products. The vapor pressure of automotive gasolines is subject to governmental regulation for pollution control purposes.

### Features and Benefits

- Conforms to ASTM D323, D1267 and related specifications
- Digital electronic temperature control
- Automatic water level control maintains proper immersion depth

### Reid Vapor Pressure Bath, 21-Unit

Constant temperature water bath immerses twenty-one test cylinders for vapor pressure tests on liquid products and liquefied petroleum gas (LPG). Electronic level control automatically maintains the proper immersion depth per ASTM specifications. Heating system employs a 6kW stainless steel heat exchanger with a heavy duty circulating pump to provide rapid heat-up, even heat distribution and ease of servicing. Convenient digital setpoint and display permits rapid selection of any bath liquid temperature within the operating range. A built-in over-temperature limit control protects against accidental overheating. Bath interior and internal components are constructed of heavy gauge stainless steel. Control panel is shielded by a hinged acrylic cover. Includes sturdy angle-iron base with corrosion resistant polyurethane finish. Order pressure gauges and cylinders separately.

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*Test apparatus for liquid products (ASTM D323) requires:*
Test Cylinders, one or two-opening type
Pressure Gauges
Constant Temperature Bath
Bath Thermometer
Transfer Connection
Manometer
Manometer Adapter

*Test apparatus for liquefied petroleum gases (ASTM D1267) requires:*
Test Cylinders, two-opening type
Bleeder Valve Assemblies
Pressure Gauges
Constant Temperature Bath
Bath Thermometer
Flexible Tubing

**Specifications**
Conforms to the specifications of: ASTM D323, D1267; GPA 2140; IP 69, 161; ISO 3007, 4256; DIN 51616, 51754; FTM 791-1201
Testing Capacity: 21 vapor pressure test cylinders
Temperature Range: 212°F (100°C)
Temperature Control Stability: ±0.2°F (±0.1°C)
Heater Range: 0-6000W
Bath Medium: 58 gal (219.5L) water

**Electrical Requirements**
220-240V 50Hz, Single Phase, 28A
220-240V 60Hz, Single Phase, 28A

**Dimensions** lxwxh,in.(cm)
Overall: 48x22x36 (122x56x91)

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2035893** | Reid Vapor Pressure Bath, 21-Unit | 220-240V 50Hz |
| **2035894** | Reid Vapor Pressure Bath, 21-Unit | 220-240V 60Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2037974** | ASTM 18F Thermometer. Range: 94 to 108°F |
| **1872714** | ASTM 18C Thermometer. Range: 34 to 42°C |
| **2036515** | ASTM 65F Thermometer. Range: 122 to 176°F |
| **2036809** | ASTM 65C Thermometer. Range: 50 to 80°C |
| **1402001** | Transfer Connection. Consists of threaded brass cup, delivery tube, and sampling tube. Use for removing liquid from the sample container in accordance with ASTM specifications. |
| **2019686** | Mercury Manometer Graduated in cm (1mm div.) and inches (0.1" div.). For checking pressure gauge reading up to 15psi. |
| **2019687** | Manometer Adapter. Attaches to pressure gauge for checking with mercury manometer |
| **1865178** | O-Ring Seal. For coupling between air and gas chambers on 1186778 and 1340200 vapor pressure bombs. |
| **1865177** | O-Ring Seal. For gauge and bleeder valve assembly connections on 1186778 and 1340200 vapor pressure bombs. |
| **2024685** | Flexible Tubing. Sulfur-free plastic lined tubing with 1/4" stainless steel and aluminum connectors. For charging LPG test cylinder. |



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## Reid Vapor Pressure Data Acquisition System

### Test Method

Vapor pressure is a critical factor in the handling and performance of liquid petroleum and liquefied petroleum gas (LPG) products. The vapor pressure of automotive gasolines is subject to governmental regulation for pollution control purposes.

### Features and Benefits

- Conforms to ASTM D323, D1267 and related specifications
- Windows®-based electronic pressure measurement software designed for Reid Vapor Pressure testing

### Reid Vapor Pressure Data Acquisition System

Windows® -based electronic pressure measurement software designed for ASTM Reid Vapor Pressure test methods. Monitors up to eight pressure vessel channels, graphing pressure and RVP data in real-time for each channel. Each channel can be run independently and configured for the pressure ranges of 0-50, 0-200, and 0-1000 psi. Pressure values can be reported in psi or kPa. Software automatically exports results into Microsoft® Excel for data analysis and storage.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2285387** | Reid Vapor Pressure Data Acquisition System | 230V 50/60Hz |
| *Includes software, data acquisition card, and multiplexer box. Requires one pressure transducer for each pressure vessel.* | | |

**Accessories**

| Catalog Number | Product Description | Range |
|---|---|---|
| **2297517** | RVP Pressure Transducer | 0-1000 psi |

## Reid Vapor Pressure Cylinders

### Test Method

Vapor pressure is a critical factor in the handling and performance of liquid petroleum and liquefied petroleum gas (LPG) products. The vapor pressure of automotive gasolines is subject to governmental regulation for pollution control purposes.

### Features and Benefits

- Conforms to ASTM D323, D1267 and related specifications
- One-opening and two-opening types

### Reid Vapor Pressure Cylinders

Polished stainless steel test cylinders for vapor pressure tests of liquid petroleum products, volatile crude oil and liquefied petroleum gas (LPG). Consists of upper chamber and lower chamber in required 4:1 volume ratio. O-ring gaskets provide tight seal between chambers and at gauge coupling. One-opening type is for gasoline and other products having a Reid Vapor Pressure below 26psi (180kPa). Two-opening type is for liquid products having a Reid Vapor Pressure above 26psi (ASTM D323) and for LPG (ASTM D1267). Lower chamber of two-opening apparatus includes straight-through ball valve and 1/4" needle valve. For LPG testing, order two-opening type apparatus and accessory bleeder valve assembly.

**Specifications**

Conforms to the specifications of: ASTM D323, D1267; GPA 2140; IP 69, 161; ISO 3007, 4256; DIN 51616, 51754; FTM 791-1201

Hydrostatic Test (two-opening type): Withstands 1000psi (6894kPa) gauge hydrostatic pressure per ASTM D1267 specifications

**Included Accessories**

Threaded 1/4" Gauge Coupling
O-ring Seals (2)

**Shipping Information**

Shipping Weight: 7 lbs (3.2kg)

**Ordering Information**

| Catalog Number | Product Description |
|---|---|
| 1186778 | Reid Vapor Pressure Cylinder, One-Opening Type |
| 1340200 | Reid Vapor Pressure Cylinder, Two-Opening Type |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| 1340201 | Bleeder Valve Assembly for LPG tests for 1340200 test cylinder |

## Reid Vapor Pressure Gauges

### Test Method

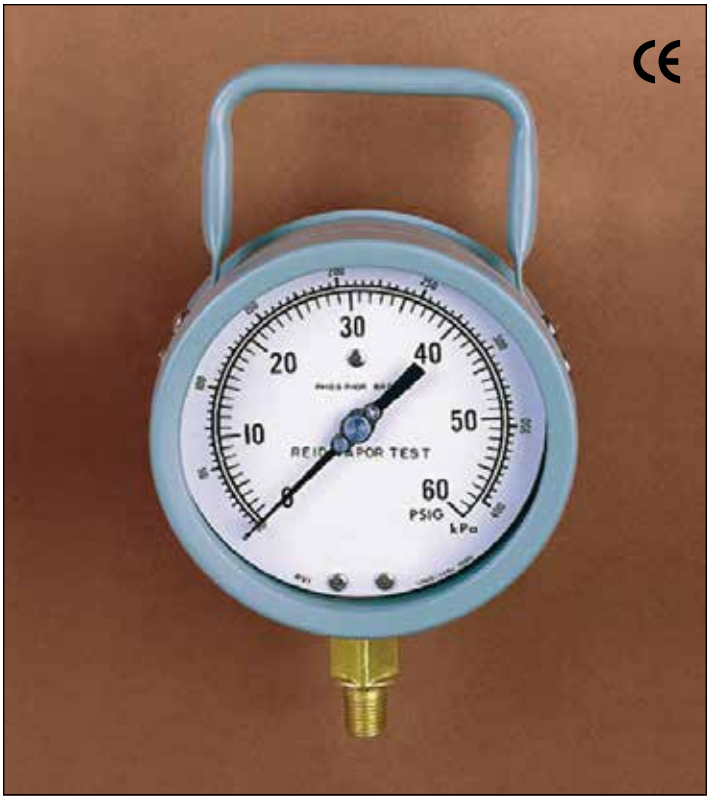
Vapor pressure is a critical factor in the handling and performance of liquid petroleum and liquefied petroleum gas (LPG) products. The vapor pressure of automotive gasolines is subject to governmental regulation for pollution control purposes.

### Features and Benefits

- Conforming to ASTM D323, D1267 and related specifications
- Dual psi/kPa scale on a 4.5" diameter dial
- Accurate to within 0.5% of scale range
- Micrometer adjustable pointer

### Reid Vapor Pressure Gauges

Ruggedly constructed Bourdon type gauge designed especially for the Reid Vapor Pressure test. Heavy duty rotary brushed stainless steel movement. Lightweight aluminum case with corrosion-resistant finish and heavy duty brass non-sparking handle. Includes blow-out disc and 1/4" NPT male thread connection.



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| Accessories | | | |
|---|---|---|---|
| **Catalog Number** | **Gauge Range (psi/kPa)** | **Figure Intervals (psi/kPa)** | **Interval Graduations (psi-kPa)** |
| **1402004** | 0-5/35 | 0.5/5 | 0.05/0.2 |
| **2023579** | 0-15/0-100 | 1.0/10 | 0.1/1.0 |
| **2037059** | 0-30/0-200 | 5.0/20 | 0.5/2.0 |
| **2042835** | 0-60/400 | 5.0/50 | 0.2/2.5 |
| **1792952** | 0-100/700 | 10/50 | 0.5/2.5 |
| **1792953** | 0-250/1750 | 25/100 | 1.0/20 |
| **2036055** | 0-600/4200 | 50/250 | 2.0/25 |

## Wax Appearance Point Apparatus

### Test Method

Detects the formation of wax crystals in burner fuels, diesel fuels and turbine engine fuels at low temperatures. The sample is cooled at a specified rate while being agitated. The temperature at which wax first appears is the wax appearance point.

### Features and Benefits

• Conforms to ASTM D3117 specifications

### Wax Appearance Point Apparatus

For detection of separated solids in burner fuels, diesel fuels and turbine engine fuels. Includes jacketed sample tube, motorized stirrer assembly, outer vacuum flask, clamps and stand.

| Ordering Information | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Electrical Requirements** |
| **2037488** | Wax Appearance Point Apparatus | 115V, 60Hz |
| **2346987** | Wax Appearance Point Apparatus | 220-240V, 50Hz |
| **2035066** | Wax Appearance Point Apparatus | 220-240V, 60Hz |

| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2036022** | ASTM 6F Thermometer. Range: -112 to +70°F |
| **1872569** | ASTM 6C Thermometer. Range: -80 to +20°C |

## Smoke Point Lamp

### Test Method

Smoke point is an indicator of the combustion qualities of aviation turbine fuels and kerosene. The fuel sample is burned in the Smoke Point Lamp, and the maximum flame height obtainable without smoking is measured.

### Features and Benefits

• Conforms to ASTM D1322 and related specifications

### Smoke Point Lamp

Burns fuel samples under controlled conditions for smoke point determinations of aviation turbine fuels and similar products. Consists of brass lamp body with chimney; gallery; 0-50mm black glass scale with white markings; brass plated door with curved glass window; candle socket; and plated brass candle with wick tube and air vent. Mounted on a cast iron base with aluminum support rod.

**Specifications**
Conforms to: ASTM D1322; ISO 3014; IP 57; DIN 51406; FTM 791-2107; NF M 07-028

**Included Accessories**
Cotton Wicks, non-extracted (6)

**Dimensions** dia.xh,in.(cm)
7x18.5 (18x47)
Net Weight: 10 lbs (4.5kg)

**Shipping Information**
Shipping Weight: 16 lbs (7.3kg)
Dimensions: 5 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description |
|---|---|
| 1452057 | Smoke Point Lamp |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| 1865168 | Extracted Cotton Wicks. Prepared in accordance with ASTM D1322 (7.2) requirements. Packed in a sealed tube with desiccant. Case of 12. |
| 1186696 | Cotton Wicks, pack of 12 |
| 1452059 | Sighting Device. Installs on chimney of Smoke Point Lamp. Eliminates parallax. |
| 1452060 | Wick Insertion Tool. Facilitates insertion of cotton wick into wick tube. |
| 2038043 | Wick Trimmer. Use together with 1452060 Insertion Tool to place wick at the correct height in the wick tube, free of twists and frayed ends. |
| 1186695 | Interchangeable Candle. |

## Freezing Point of Aviation Fuels

### Test Method

The freezing point of an aviation fuel is the lowest temperature at which the fuel remains free of solid hydrocarbon crystals that can restrict the flow of fuel. The temperature of the fuel in the aircraft tank normally falls during flight depending upon aircraft speed, altitude, and flight duration. The freezing point of the fuel must be lower than the minimum operational tank temperature. The test determines the temperature below which solid hydrocarbon crystals form in aviation fuels. The sample is cooled with continuous stirring in a Dewar-type sample tube until crystals appear.

### Features and Benefits

- Improved design with enhanced performance and safety features
- Operating range to –100°F (–73°C)
- Microprocessor PID digital temperature control
- Dual digital displays show setpoint and actual bath temperature
- Selectable temperature scale – Fahrenheit or Celsius
- Conforms to ASTM D2386 and related specifications

### Freezing Point of Aviation Fuels

Redesigned constant temperature bath for freezing point determinations on fuel samples at temperatures as low as –100°F (–73°C). Accommodates 1186706 Freezing Point Apparatus and accessory stirrer. Microprocessor PID circuitry provides precise, reliable temperature control within ASTM specified tolerances. Simple push button controls and dual digital displays permit easy setting and monitoring of bath temperature. Bath medium is contained in a clear, evacuated Dewar flask, and glare-free fluorescent backlighting provides excellent visibility when working with the freezing point samples. Air-cooled hermetic compressors provide efficient operation with the use of CFC-free refrigerants. Temperature control uniformity is assured by means of a motorized stirrer which provides

complete circulation without turbulence. Cabinet construction is polyester-epoxy finished steel with a chemical-resistant composite top surface. Working (top) surface includes port and mounting plate for 1186706 Freezing Point Apparatus and accessory stirrer. Bath rests on adjustable leveling feet.

**Specifications**
Conforms to: ASTM D2386; IP 16; ISO 3013; DIN 51421; FTM 791-1411; NF M 07-048
Temperature Range: Ambient to –100°F (–73°C)
Temperature Control Accuracy and Uniformity: Exceeds ASTM requirements throughout the operating range
Display: 0.1°C/°F resolution

**Electrical Requirements**
115V, 60Hz, Single Phase, 18.3A
220-240V, 50Hz, Single Phase, 10.0A
220-240V, 60Hz, Single Phase, 10.0A

**Dimensions** lxwxh,in.(cm)
35x26x31 (89x66x78.75)

Net Weight: 259 lbs (117.5 kg)

**Shipping Information**
Shipping Weight: 373 lbs (169.5 kg)
Dimensions: 23.75 cu.ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **1844109** | Refrigerated Freezing Point Bath | 115V, 60Hz |
| **1844110** | Refrigerated Freezing Point Bath | 220-240V, 50Hz |
| **1844111** | Refrigerated Freezing Point Bath | 220-240V, 60Hz |
| **1186706** | Freezing Point Apparatus, ASTM D2386 | |
| **2037704** | Stirrer Motor | 115V, 60Hz |
| **1716163** | Stirrer Motor | 220-240V, 50Hz |
| **2035921** | Stirrer Motor | 220-240V, 60Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2037197** | ASTM 114C Thermometer. Range: -80 to +20°C |
| **2035316** | Moistureproof Collar, Type A Use in place of brass packing gland to prevent condensation of moisture. |
| **2038064** | Moistureproof Collar, Type B. Use to prevent condensation. |

# Rust Preventing Characteristics Oil Bath

## Test Method

Used to control corrosion in product pipelines caused by moisture condensed from gasoline and distillate fuels. Anti-rust properties are determined by immersing a polished steel test specimen in a stirred mixture of the sample and distilled water held at constant temperature.

## Features and Benefits

- Conforms to NACE TM-01-72, ASTM D665* and D3603* specifications
- Accommodates six sample beakers
- Microprocessor temperature control with digital display and over-temperature protection

## Rust Preventing Characteristics Oil Bath

Six-place constant temperature bath with stirrers for rust preventing characteristics tests. Stirs sample-water mixtures at 1000rpm and controls temperature with ±0.5°C (±1°F) stability. Immerses test beakers at the proper depth per NACE specifications. Microprocessor temperature control has °C/°F switchable digital setpoint and display. Operator and equipment are protected by an over-temperature control circuit which automatically interrupts power to the unit should bath temperature exceed a programmed cut-off point. Stainless steel stirrer paddles are driven at 1000rpm by an improved pulley drive-roller bearing arrangement. Paddles move to a raised position for placement of sample beakers in the bath. Stainless steel bath includes perforated support shelf for beakers

and cover plate. Long lasting polyester drive belt improves reliability. Drive train components are protected by a removable steel guard. All exterior surfaces have stainless steel or chemical resistant polyurethane enamel finishes.

*This equipment has been modified for safe operation when testing volatile petroleum products in accordance with NACE Standard Test Method TM-01-72.*

**Specifications**
Conforms to the specifications of: NACE TM-01-72; ASTM D665*, D6158, D3603*; IP 135; ISO 7120; DIN 51585; FTM 791-4011; NF T 60-151
Testing Capacity: Six (6) 400mL sample beakers
Maximum Temperature: 104°C (220°F)
Temperature Control Stability: ±0.5°C (±1°F)
Heater Range: 0-1500W
Drive Motor: explosion proof ball bearing type
Bath Medium: 11 gal (41.6L) white technical oil
**Included Accessories**
Steel Test Specimens (6)
Type 2 Plastic Specimen Holders (6)
Plastic Beaker Covers (6)
**Electrical Requirements**
115V, 60Hz, Single Phase, 13.0A
220-240V, 50Hz, Single Phase, 6.8A
220-240V, 60Hz, Single Phase, 6.8A
**Dimensions** lxwxh,in.(cm)
32.75x14 .25x27 (83x36x69)
Net Weight: 79 lbs (35.8kg)
**Shipping Information**
Shipping Weight: 150 lbs (68kg)
Dimensions: 16.2 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **1844112** | Rust Preventing Characteristics Oil Bath | 115V, 60Hz |
| **1844113** | Rust Preventing Characteristics Oil Bath | 220-240V, 50Hz |
| **1844114** | Rust Preventing Characteristics Oil Bath | 220-240V, 60Hz |



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| Ordering Information | |
|---|---|
| **Catalog Number** | **Product Description** |
| **1186707** | Steel Test Specimens for ASTM D665/NACE TM-01-72. Machined to ASTM/NACE specifications. Without holder. |
| **1395948** | Test Specimen with Type 2 PMMA Holder for ASTM D665/NACE TM-01-72 |
| **2037707** | Test Specimen with Type 2 PTFE Holder |

| Ordering Information | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2037609** | Test Beaker, 400mL, for NACE TM-01-72 |
| **1793619** | ASTM 9F Thermometer. Range: 20 to 230°F |
| **2036580** | ASTM 9C Thermometer. Range: -5 to +110°C |
| **2036879** | Chuck for polishing test specimens. Includes locknut and shaft for mounting on accessory drive motor. |
| **2037012** | Drive Motor. Drives 2036879 Chuck. Mounted on base. 115V 60Hz. |
| **2037811** | Silicone Carb Abras Cloth, PK50 |

## Cold Filter Plugging Point Bath

### Test Method

Determines the low temperature flow characteristics of automotive diesel fuels and gas oils, including samples with flow improving additives, by measuring the temperature at which the sample ceases to flow through a wire mesh filter under standard test conditions. Complete test consists of Cold Filter Plugging Point Apparatus, Vacuum System and Cooling Bath.

### Features and Benefits

- Conforms to ASTM D6371, IP 309 and DIN 51428 specifications
- Choice of mechanically refrigerated or dry ice cooled bath

### Cold Filter Plugging Point Bath

Cold Filter Plugging Point Apparatus–Includes Pyrex™ test jar with graduation, brass jacket with plastic support ring, plastic stopper, plastic insulating ring and spacer, pipette and brass filter unit with stainless steel fine wire mesh screen.

**Vacuum System**–Connects to Cold Filter Plugging Point Apparatus to draw sample through filter screen. Consists of U-tube Manometer (without mercury), three-way stopcock, air vent tube, cork stopper with elbows, and large glass bottle. Vacuum pump is not included.

**Cooling Baths**–Choice of mechanically refrigerated or dry-ice cooled baths. Mechanically refrigerated model utilizes a cascade hermetic cooling system to attain temperatures as low as –90°F (–68°C). Cold Filter Plugging Point Apparatus inserts in composition top plate of bath. Insulated stainless steel tank and polished stainless steel cabinet. or with corrosion resistant polyurethane enamel finish. Composition top plate suspends Cold Filter Plugging Point Apparatus in freezing mixture at the required depth. Handles on exterior permit easy emptying of freezing mixture. Supplied with thermometer holder.

**Specifications**
Conforms to the specifications of: ASTM D6371; IP 309; DIN 51428

**Electrical Requirements**
Mechanically Refrigerated Baths
115V 60Hz, Single Phase, 6A
220-240V 50Hz, Single Phase, 3A

**Dimensions*** in.(cm):
Refrigerated Model (lxwxh):
35x26x31 (89x66x78.75)
Net Weight: 259 lbs (117.75kg)

Dry-Ice Model (dia.xh):
12x12 (30x30)
*Cooling Bath

**Shipping Information**
Shipping Weight:
Refrigerated Model: 373 lbs (169.5kg)
Dry-Ice Model: 19 lbs (8.6kg)
Dimensions:
Refrigerated Model: 23.75 Cu. ft.
Dry-Ice Model: 3 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **1340240** | Cold Filter Plugging Point Apparatus | |
| **2037049** | Vacuum System | |
| **2037290** | Mechanically Refrigerated Cold Filter Plugging Point Cooling Bath | 115V 60Hz |
| **2037967** | Mechanically Refrigerated Cold Filter Plugging Point Cooling Bath | 220-240V 50Hz |
| **2037849** | Cooling Bath, Dry Ice Model | |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **1793022** | ASTM 5C Thermometer. Range: –38 to +50°C |
| **1872569** | ASTM 6C Thermometer. Range: –80 to +20°C |

## Automatic Cold Filter Plugging Point System

### Test Method

Determines the low temperature flow characteristics of automotive diesel fuels and gas oils, including samples with flow improving additives, by measuring the temperature at which the sample ceases to flow through a wire mesh filter under standard test conditions.

### Features and Benefits

- Conforms to ASTM D6371 and related specifications
- Direct cooling system eliminates the need for solvent cooling baths
- One-stage cooling system provides temperatures as low as –35°C and a two-stage cooling system down to –80°C
- Single start/stop push button makes system simple to use
- Minimal installation required to set-up software and instrumentation

### Automatic Cold Filter Plugging Point System

Cold Filter Plugging Point Detection–The cold filter plugging point detection system provides automated sample testing with the accuracy and repeatability in accordance with ASTM D6371 and related international test

methods. The sample is cooled according to the pre-selected temperature profile. A 20 mbar vacuum is applied at specific intervals to the sample across a 45 micron mesh filter into the aspiration glass cell assembly. If it takes more than 60 seconds for the sample to reach the upper barrier detector or more than 60 seconds to return below the detector upon release, then the test is completed and the cold filter plugging point has been reached.

**Advanced Software Package** – The Windows®-based software package can control either a stand-alone system or provides multiple analyzer networking with a single network control station. All analytical parameters are graphed and displayed in real-time as well as recorded in Microsoft® Excel file format. The software monitors the operation and performance of all the analyzer components for proper data measurement, including the solenoid valves, cooling system, other moving parts, as well as the Pt-100 temperature probes and the pressure sensors. The calibration curves for each probes and sensors are displayed individually and saved to the hard disk with date and time of test.

**Cooling System**–For various user applications, the automated cold filter plugging point system is available with either one-stage cooling for temperatures as low as –35°C or two-stage cooling for temperatures as low as –80°C. The direct cooling system requires no solvent cooling bath and thus eliminates operator exposure to solvents used in standard cooling systems. The direct system is capable of rapid cooling, approaching –80°C bath temperatures in approximately 15 minutes, and utilizes less electricity than in standard cooling systems. The rapid cooling feature combined with a consistent cooling profile system provides repeatable results with high test reproducibility.

**Multiple Configuration System**–These automated sample cooling and physical property measurement systems can be configured with up to six test positions with one of five possible test heads at each position: cloud point, pour point, cloud & pour point, freezing point, and cold filter plugging point.
Standard and customized multiple configuration systems are readily available. Please inquire with EXPOTECH USA customer service about product specifications and ordering information.

**PC Configuration**– Operation of the software package requires the use of a PC, which should be ordered separately. The PC should have the following minimum requirements: Pentium III 800 MHz processor, 128 MB RAM, 2 GB hard drive, CD-ROM, Windows® 95/98 operating system, Microsoft® Excel, Windows® keyboard, monitor, mouse, graphic and video cards.

**Specifications**
Conforms to the specifications of: ASTM D6371; IP 309; DIN 51428

**Electrical Requirements**
Mechanically Refrigerated Baths
115V 60Hz, Single Phase, 6A
220-240V 50Hz, Single Phase, 3A

**Specifications**
Conforms to the cold filter plugging point specifications of:
ASTM D6371; IP 309; EN 116

**Electrical Requirements**
115V 60Hz, Single Phase
220V 50Hz, Single Phase

**Dimensions** lxwxh,in.(cm)
(for the 2346891 system)
26x24x61.5 (66x60x80)
Net Weight: 132 lbs (60kg)

*You may order a multiple configuration system (any combination of freezing point, cloud and cloud/pour point, and cold filter plugging point) with up to six heads. Please specify each measurement head with its associated catalog number using the sequential number combination. On-line version of this product is available. Please contact* EXPOTECH USA *customer service for additional information.*

**Ordering Information**

| Catalog Number | Product Description |
|---|---|
| **2346891** | Automatic Cold Filter Plugging Point System, (one-head unit), single stage (to –35°C) |
| **2042622** | Vacuum System for Cold Filter Plugging Point |

*Please specify voltage and cooling requirements when ordering.*

# Portable Octane Analyzer with Cetane Index and Cetane Number

## Test Method

Determines the Pump Octane Number (AKI), Research Octane Number (RON), and Motor Octane Number (MON) of unleaded gasolines, and optional Cetane Index and Cetane Number for diesel fuels.

## Features and Benefits

- Test results equivalent to ASTM D2699 and D2700 test methods
- Measures all grades of unleaded gasoline
- Test results equivalent to ASTM D613 for Cetane Number of diesel fuels (Optional with 2024151)
- Displays results in 20 seconds
- Directly measures octane number for {(R+M)}/2, RON and MON
- Optional feature for cetane index and cetane number determination of diesel fuels
- Includes RS-232 output, built-in printer and LCD display
- Results traceable to official knock engine laboratory
- GPS model available for use with GPS locator accessory

## Portable Octane Analyzer with Cetane Index and Cetane Number

The analyzer measures octane number via near-infrared (NIR) transmission spectroscopy utilizing 14 near-infrared emitting diodes with narrow bandpass filters, a silicon detector system, and a fully integrated microprocessor. Simple octane number determination requires three easy steps: sampling a background signal, acquiring two absorption spectra of the gas sample, and then acquiring a second background signal. Analyzer is pre-calibrated for unleaded gasoline and ethanol-blended fuels, and can be calibrated for up to eight additional fuel types.

The analyzer is small, lightweight, and operates on AA batteries or AC. Before each reading, the unit standardizes itself to assure accuracy. The octane number is printed with time and date on the built-in printer. An optional model with a GPS locator and automatic fuel selector is also available. All data can be downloaded via the RS232 port to an external computer.

**Specifications**

Accuracy and repeatability equivalent to ASTM approved CFR engines test methods (ASTM D2699 and D2700 for Octane Number and ASTM D613 for Cetane Number)

Sample Holder: Sealed, cylindrical glass container (75mm optical path length)
Sample Volume: 8 Ounces (approx. 225 mL)
Precalibrated for unleaded gasoline & ethanol-blended fuels. (Analyzer can be calibrated for up to 8 additional fuel types.)
Battery operated (6 AA batteries)

**Included Accessories**

IBM Compatible Software
RS232 Cable
Aluminum Carrying Case
5 Rolls of paper
3 Sample Holders
Light Shield
6 AA Batteries
6 Sample Holder Labels

**Dimensions** lxwxh,in. (cm)
13.5x4.5x2.5 (34x11.5x6.25)
Net Weight: 12 lbs (5.5kg)

**Shipping Information**

23x17x8.5 (58.5x43.25x22)
Shipping weight: 25 lbs (11.5kg)

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **1790893** | Portable Octane Analyzer | 115V 50/60Hz |
| **1790893** | Portable Octane Analyzer GPS Model Requires GPS Locator Feature | 115V 50/60Hz |



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| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2037850** | Printer Paper, 10 Rolls |
| **2035069** | Additional Fuel Calibration |
| **2035125** | Sample Holder (additional) |
| **2037945** | Sample Holder (Box of 12) |
| **2023301** | Light Shield |
| **2024152** | RS232 Cable |
| **2023300** | Aluminum Sample Carrying Case w/12 Sample Holders |
| **1790903** | Sample Holder Lids, 12 |
| **2037824** | Sample Holder Labels, 12 |
| **2036455** | 25 Sample Memory |
| **2024151** | Cetane Index and Cetane Number |
| **2059183** | GPS Locator (for 1790893-GPS model only) |

## Constant Temperature Pressure Hydrometer Water Bath

### Test Method

Density and relative density measurements of light hydrocarbons, including LPG, are used for transportation, storage and regulatory purposes. The measurement is made by floating a thermohydrometer in a sample that has been introduced into a pressure cylinder.

### Features and Benefits

- Conforms to ASTM D1657 and related specifications
- Mechanically refrigerated for convenient sub-ambient temperature operation

### Constant Temperature Pressure Hydrometer Water Bath

Immerses two Pressure Hydrometer Cylinders at 60°F (15°C) for density and relative density determinations of LPG and other light hydrocarbons. Mechanically refrigerated cooling system maintains sub-ambient temperature. Thermistor activated solid state temperature controller and 750W copper immersion heater maintain bath temperature with ±0.5°F (±0.2°C) stability. A 1/20 hp ball bearing stirrer circulates the bath medium to assure temperature uniformity. Stainless steel tank is fiberglass insulated. Equipped with overflow standpipe/drain. Steel exterior has a durable polyurethane enamel finish.

**Specifications**

Conforms to the specifications of: ASTM D1657; IP 235; ISO 3993
Controller Sensitivity: ±0.5°F (±0.2°C)
Capacity: Two (2) 1791275 cylinders

**Electrical Requirements**

115V 60Hz, Single Phase, 12.5A
220-240V 50 or 60Hz, Single Phase, 6.4A

**Dimensions** lxwxh,in.(cm)

Bath interior: 12x18x22(30x46x56)
Overall: 18x20x49 (46x51x124)
Net Weight: 158 lbs (71.7kg)

**Shipping Information**

Shipping Weight: 186 lbs (84.4kg)
Dimensions: 15.4 Cu. ft.

| Ordering Information | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Electrical Requirements** |
| **1340237** | Constant Temperature Pressure Hydrometer Water Bath | 115V, 50/60Hz |
| **2036105** | Constant Temperature Pressure Hydrometer Water Bath | 220-240V, 60Hz |
| **2024141** | Constant Temperature Pressure Hydrometer Water Bath | 220-240V, 50Hz |

| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2037926** | ASTM 12F Thermometer. Range –5 to +215°F |
| **1793023** | ASTM 12C Thermometer. Range –20 to +102°C |



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## Pressure Hydrometer Cylinder

### Test Method

Density and relative density measurements of light hydrocarbons, including Liquefied Petroleum Gas (LPG), are used for transportation, storage and regulatory purposes. The measurement is made by floating a thermohydrometer in a sample that has been introduced into a pressure cylinder

### Features and Benefits

- Conforms to ASTM D1657; NF M 41-008 and related specifications
- Built-in safety relief valve

### Pressure Hydrometer Cylinder

Transparent plastic cylinder mounted between machined aluminum end plates and surrounded by stainless steel safety guard. Use together with ASTM 310H Thermohydrometer to determine density or relative density of LPG and light hydrocarbons. Equipped with inlet, outlet and vapor vent valves for admitting sample and purging cylinder. End plates have positive sealing buna-N O-rings and are joined by sturdy steel support rods. Top plate detaches easily without tools for insertion or removal of thermohydrometer. Safety relief valve prevents unsafe pressure build-up inside cylinder. Mounted on a finished steel base.

**Specifications**
Conforms to the specifications of: ASTM D1657; GPA 2140; IP 235; ISO 3993; NF M 41-008
Safety relief valve: 200psi (1.4MPa)

**Dimensions** dia.xh,in.(cm)
8.25x23.75 (21x60)
Net Weight: 5 lbs (2.3kg)

**Ordering Information**

| Catalog Number | Product Description |
|---|---|
| 1791275 | Pressure Hydrometer Cylinder |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| 1793903 | ASTM 101H Thermohydrometer. Nominal Relative Density Range: 0.500 to 0.650 Standard Temperature,°F: 60/60. Temperature Range, °F: 30 to 90 |
| 1793025 | ASTM 310H Thermohydrometer. Density Range kg/m3: 500 - 650 Standard Temperature, °C: 15. Temperature Range, °C: 0 to 35 |

## Fluorescent Indicator Absorption Apparatus

### Test Method

Determines saturates, olefins and aromatics in petroleum fractions that distill below 315°C.

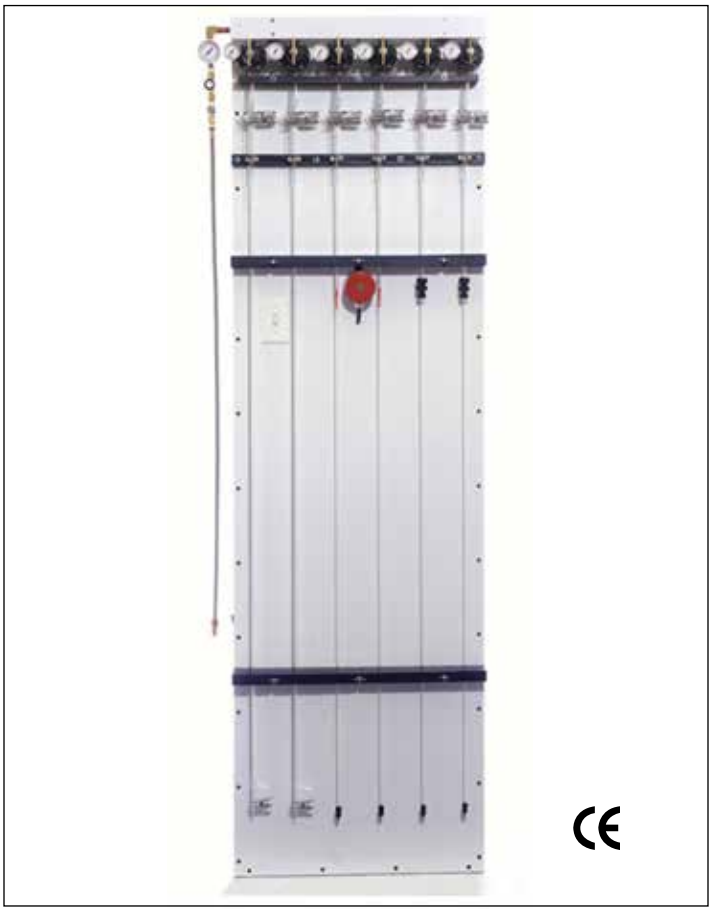
### Features and Benefits

- Conforms to ASTM D1319 specifications
- Quick connections for columns for faster set-up and analysis
- Integrated vibration system for dry silica gel packing
- Handheld UV Lamp
- Two, four, or six column models available

### Fluorescent Indicator Absorption Apparatus

A complete system for conducting FIA analyses of a single or up to six samples simultaneously. Each system is complete with an upper

multi-position air pressure manifold with independently-operated gauges, pressure regulators and ball O-ring joints allowing for individual pressure control at each column. Each pressure regulator may be set at any point from 0-15 psi and will maintain the set pressure regardless of changes in back pressure. An integral pressure gauge on each station continuously registers the active pressure on each column. The ball O-ring connection system connects the pressure regulators to the upper columns, and the proper seal is achieved by applying moderate clamping pressure of stainless steel clamps without utilizing any grease. Convenient O-ring compression type fittings simplify the connection of the analyzer tubes (3mm OD x 1200mm) to the upper columns. The internal geometry of the fittings is optimized for transition between tubing diameters, and a simple twist of the connection fitting releases the analyzer tube. O-ring compression type fittings are also used to cap the end of each analyzer tube with the column support tips. The tips contain an internal porous polyethylene disc in order to support the silica gel packing in each analyzer tube. An integrated electric vibration system is mounted to the upper chassis so that the columns can be vibrated to facilitate the dry gel packing procedure, and features an on/off and amplitude selector switch. The complete unit also includes a 1mL syringe with 4" needle, two gel bottles for pouring silica gel, extra O-rings, stainless steel ball-and-socket joint clamps, and two mounting brackets with screws for stabilizing chassis.



**Specifications**

Conforms to the specifications of: ASTM D1319; IP 156; NF M 07-024

**Included Accessories**

Syringe, 1mL
Bottles (2)
O-Rings
Ball-and-Socket Joint Clamps
Mounting Brackets (2)
Integrated Electric Vibration
Handheld UV Lamp

**Dimensions** lxwxh,in. (cm)
8x26x82 (20x66x208)
Net Weight: 100 lbs (45.5kg)

**Shipping Information**

Shipping Weight: 121 lbs (55kg)
Dimensions: 12 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2037267** | Fluorescent Indicator Absorption Apparatus, Two-Position | 115V 50/60Hz |
| **2023231** | Fluorescent Indicator Absorption Apparatus, Two-Position | 230V 50/60Hz |
| **2038253** | Fluorescent Indicator Absorption Apparatus, Four-Position | 115V 50/60Hz |
| **2037349** | Fluorescent Indicator Absorption Apparatus, Four-Position | 230V 50/60Hz |
| **2036826** | Fluorescent Indicator Absorption Apparatus, Six-Position | 115V 50/60Hz |
| **2037689** | Fluorescent Indicator Absorption Apparatus, Six-Position | 230V 50/60Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2035528** | Silica Gel, 500 Gram Bottle |
| **2037962** | Silica Gel, Dried, 40 Gram Bottle |
| **2303494** | Standup UV Lamp, 115V |

# Volatility and Residues in Liquefied Petroleum (LP) Gases

## Test Method

The volatility of liquefied petroleum (LP) gases is determined by allowing a precooled sample to weather under specified conditions and observing the temperature when 95% has evaporated. Residues in LP gases are determined by weathering of a precooled sample and determination of the volume remaining at 100°F (37.8°C).

## Features and Benefits

• Conforms to ASTM and GPA specifications

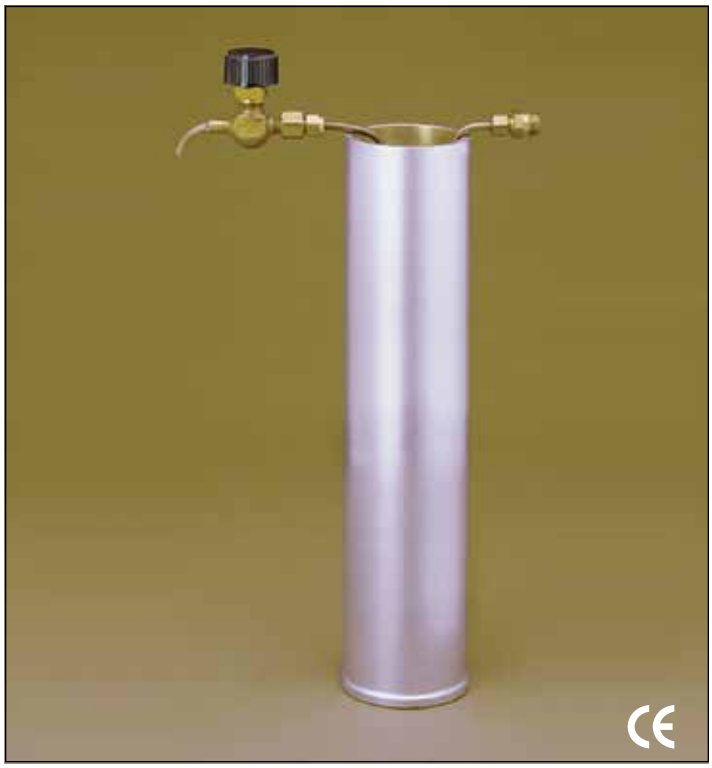
## Volatility and Residues in Liquefied Petroleum (LP) Gases

Consists of brass cooling vessel with built-in 20 ft. (6m) copper cooling coil. Includes compression fittings and 1/8 needle valve at the down-stream end.

**Specifications**

Conforms to the specifications of: ASTM D1837; D2158; GPA 2140; ISO 13757

**Dimensions*** dia.xh,in.(cm)
3x11.75 (7.6x29.9)
* Cooling Vessel



**Ordering Information**

| Catalog Number | Product Description |
|---|---|
| 1794180 | Precooling Apparatus |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| 2037293 | Weathering Tube, 100mL |
| 2037269 | Stand, for weathering tube |
| 2036757 | Clamp, for weathering tube |
| 2036389 | Clamp Holder |
| 2037861 | Syringe, 1mL (ASTM D2158) |
| 2038279 | Needle, 8”/203mm (ASTM D2158) |
| 2037545 | ASTM 99F Thermometer. Range: –55 to +41°F |
| 2035158 | ASTM 5F Thermometer. Range: –36 to +120°F |
| 1793022 | ASTM 5C Thermometer. Range: –38 to +50°C |
| 1795193 | ASTM 57F Thermometer. Range: –4 to +122°F |
| 1795194 | ASTIM 57C Thermometer. Range: –20 to +50°C |



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# Semi-Automatic Bocle Fuel Scuff and Lubricity Testers
# Models 2046894 and 2025365

## Measure Lubricating Properties Of Diesel And Turbine Fuels With Increased Speed, Accuracy

**ASTM D6078 & D5001**

- Semi-Automated Ball-On Cylinder Lubricity Evaluators (BOCLE)
- Two Models Available:
  - 2046894 adds automation to ASTM D6078 diesel fuel scuff testing and ASTM D5001 tribune fuel lubricity testing.
  - 2025365 simplifies ASTM D5001 turbine fuel lubricity testing
- Precisely controls test fuel temperature and relative humidity.
- Digitally displays all test conditions - test ring RPM, temparature, relative humidity, elapsed time, 2046894 also provides friction force display and analog output.
- Suitable for more viscous lubricants when equipped with an optional electricity heated fuel test tank (2044155)

A load cell calibration weight set is included with the instrument to verify accuracy of the load-readings.

## Models 2046894 and 2025365

**UTILIZE THE ONLY INSTRUMENT SPECIFIED IN BOTH ASTM D6078 AND D5001**

2046894 measures friction force generated when a stationary ball contracts a rotating cylinder that is partially impressed in test fluid. During ASTM D6078 testing, load on the stationary ball incrementally increases until a specific friction force is exceeded, indicating scuffing has occured. The friction force measurment is displayed locally on a digital readout and output as an analog signal.

2046894 and 2025365, according to ASTM D5001, generate a wear scar produced by friction between a stationary ball and rotating cylinder. Following a 30 minute test run at a prescribed load, the test ball is automatically lifted off the cylinder. Major and minor axes of the resultant wear scar on the ball are then gauged by the operator using a calibrated microscope (optional 2024857). Measurement reveals the sample's wear scar rating.

In both methods, the test fluid's temperature and the surrounding air's relative humidity are carefully controlled and maintained, providing consistent, stable results.

**Specifications**

| | 2046894 | 2025365 |
|---|---|---|
| **ASTM Compliance** | ASTM D6078 diesel fuel scuff test.<br>ASTM D5001 Turbine fuel lubricity test. | ASTM D5001 Turbine fuel lubricity test. |
| **Utility Requirements** | Electrical: 120 VAC/60 Hz or 220 VAC/50 Hz.<br>Gases: Dry, clean compressed or bottled air. | |
| **Control Cabinet** | Measures 24 (W) x 36 (H) x 10 (D) inches. Digitally displays test ring RPM, temperature, relative humidity, elapsed time. Semi-automatic in purge and test cycle. Precision flowmeters. Automatic pneumatic balance arm actuator. | |
| **Testing Machine** | Direct drive DC motor. Iptional RPM encoder. Micrometer for cylinder track positioning. Polished stainless steel fuel tank with integral heating/cooling passages. Load arm with integral friction force transducer. | Direct drive DC motor. Optical RPM encoder. Micrometer for cylinder track positioning. Polished stainless steel fuel tank with integral heating/cooling passages . |
| **Standard Equipment** | Friction force indicator (digital). Friction force output (analog). reservoir with submersible pump. 0.5 to 6.0 kg weight set, Ring ball retainers. Load cell calibration set. Tool kit. Operating manual. | Reservoir with submersible pump. 500 g weight. Ring ball retainers. Tool kit. Operating manual. |
| **Optional Equipment** | Strip chart recorder (2024856).<br>Lighted microscope, 100 power with 0.01 mm graduated scale (2024857).<br>Electrically heated test tank (2044155) | Lighted microscope, 100 power with 0.01 mm graduated scale (2024857).<br>Electrically heated test tank (2044155) |



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# Automatic Non-Woods Metal Noack Evaporative Apparatus

## Test Method

For determining the evaporation loss of lubricating oils, particularly engine oils. High temperatures can evaporate oil which may contribute to oil consumption in an engine and can lead to a change in the properties of an oil. A measured quantity of sample is placed in an evaporation crucible that is then heated to 245.2°C with a constant flow of air drawn through it for 60 minutes. The loss in mass of the oil is determined.

## Automatic Non-Woods Metal Noack Evaporative Apparatus

- Conforms to ASTM D5800, Procedure B
- 6.5" Integrated Touch Screen Panel PC
- Integrated Vacuum Pump with automatic electronic control system
- Direct sample temperature measurement via PT100 probe
- Equipped with high resistant Kalrez valve, inlet filter to remove product residuals
- USB port for connection to an external printer and/or external PC
- Storage capacity for more then 60,000 analysis
- CE Marked

The Automatic Non-Woods Metal Noack Evaporative Apparatus tests for the evaporation loss tendencies of lubricating oils at temperatures of up to 275°C. The newly designed electrically heated aluminum block allows for testing without the use of hazardous Woods Metal. The Noack tester is equipped with an Electronic regulator allowing for automatic control of temperature and differential pressure. The system is managed by an integrated 6.5" Touch Screen Panel PC by means of the Noack Evaluation Software run by a Windows® based operating system. The Evaluation Software is capable of recording all analytical parameters, allowing for user customizable parameters, methods and result reports as well as printing graphs and test results.

### Specifications

Conforms to the specifications of:
ASTM D5800 Procedure B; IP 421; DIN 51581
Capacity: 1 Sample
Temperature Range: 225°C to 275°C
Temperature Resolution: 0.01°C
Temperature Accuracy: ±0.2°C

Repeatability/Reproducibility: Meets or Exceeds ASTM D5800
Ambient Temperature: Max. 35°C
Relative Humidity: Max 80%
Heater Power: 420W
Electrical Requirements:
115V 60Hz
220V 50/60Hz

### Included Accessories

Integrated Touch Screen Panel PC
Integrated Vacuum Pump
Inlet Filter
Evaporation Crucible
Test Ball (10)
Nozzle Cleaner
Crucible Holder
Protective Gloves
Hook Wrench
Pliers

**Dimensions** lxwxh,in.(cm)
15.75x17.72x17.72 (40x45x45)
Net Weight: 48.5 lbs (22 kg)

### Ordering Information

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2327049** | Automatic Non-Woods Metal Noack Evaporative Apparatus | 220V 50/60Hz |



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| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2346845** | Noack Evaluation Software |
| **2327050** | Glassware Accessory Set. Includes: 2L Glass Bottle (2), Rubber Stopper (4), Glass Delivery Tubes, Silicon Connection Tubing |
| **2327051** | Stand for Glass Bottles with Inclined Manometer, 0-50mm H2O |
| **2327052** | Noack Reference Oil, 1 Liter |
| **2019851** | Set of Calibration Connectors and Cables |
| **2277500** | Calibration Decade Box – PT100 Simulator |

## Dielectric Breakdown Voltage of Insulating Oils

### Test Method

The majority of high-voltage transformers, cables, switchgears, transducers, capacitors, and rectifiers use insulating oils for insulating electrically live parts and to carry off thermal energy. The quality of the insulating oil must be checked at regular intervals to ensure a long equipment service life. The most important requirement of an insulating oil is a high dielectric strength. Determination of the dielectric breakdown voltage of insulating oils provides an early detection method for any reduction in the insulating properties.

**Specifications**

Conforms to the specifications of:
ASTM D877, D1816; BS EN 60156; CEI EN 60156; IEC 156;
VDE 0370 Pt. 5
Output Voltage: Up to 75kV rms symmetrical
Voltage measurement accuracy: 0 - 75kV ±1kV
Voltage slew rate: 0.5 - 10kV/s
Resolution (displayed): 0.1kV
Power Supply: 85V - 264V, 47Hz - 63Hz, 12V external supply
Power consumption: 60VA
Internal rechargeable battery: 1 x 12V / 7.2Ah
Switch-off time on flashover: < 5†s
Measurement of oil temperature: 0 - 100°C / 32 - 212°F
Temperature Resolution: 1°C / 1.8°F
Display: 2.8" color (ultra bright)
Selectable Programs: ASTM D1816-04-1mm, ASTM D1816-04-2mm, ASTM D877-02A, ASTM D877-02B, IEC 156/95
Customer-specific programs: Unlimited
PC Software: Included
Printer: Dot Matrix Hard Copy Output

Interface: Bluetooth
USB: USB memory stick
Operating Temperature: -5°C - 45°C (23°F - 113°F)
Storage Temperature: -20°C - 60°C (-4°F - 140°F)
Relative Humidity: Non-condensing

**Included Accessories**

Calibration Sheet
AC Power Cable
User Manual

**Dimensions** WxHxD,in.(cm)
16.9x11x9.85 (43x28x25)
Net Weight: 48.5 lbs (22kg)

**Shipping Information**

Shipping Weight: 54.5 lbs (24.7kg)
Dimensions: 25x21x19in. (63.5x53.4x48.3cm)

| Ordering Information | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2262491** | Automatic Dielectric Breakdown Tester, 0-75kVAC |



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| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2262498** | Optional Internal Battery with Charger (Option to be ordered together with 2262491) |
| **2262499** | Optional Integrated Printer (Option to be ordered together with 2262491) |
| **2262500** | Transport Case |
| **2262492** | Test Vessel complete with electrodes for ASTM D1816 |
| **2262493** | Test Vessel complete with electrodes for ASTM D877 |
| **2262494** | Spacer Gauge, 1mm |
| **2262495** | Spacer Gauge, 2mm |
| **2262496** | Spacer Gauge, 2.5mm |

## Foaming Characteristics Apparatus & Data Acquisition Software

### Test Method

Foaming of lubricating oils in applications involving turbulence, high speed gearing or high volume pumping can cause inadequate lubrication, cavitation, overflow and premature oxidation. The sample is blown with a controlled volume of air at different specified temperatures, including a newer high temperature test at 150°C. The resultant foam is measured at the end of each aeration period and at different intervals afterward. In the high temperature test, the amount of time required for the foam to collapse to "0" after the aeration period is also measured.

### Features and Benefits

- Dual-twin models for standard foaming characteristics tests
- High temperature liquid baths for 'Sequence IV' tests
- Automatic time sequence models for both tests
- Custom configurations for specialized applications

## Foaming Characteristics Apparatus

Performs two tests at 75°F (24°C) and two tests at 200°F (93.5°C). Consists of two 12x18" (30.5x45.7cm) constant temperature baths with 1000mL test cylinders, certified diffusers, air delivery tubes, and flowmeters (94mL/min.) for each sample. Baths are equipped with microprocessor temperature controls, copper immersion heaters and 1/20hp circulation stirrers to maintain temperature uniformity of ±1°F (±0.5°C). Microprocessor PID control provides quick temperature stabilization without overshoot and the bath is protected by an overtemperature control circuit that interrupts power should bath temperature exceed a programmed cut-off point. Dual LED displays provide actual and setpoint temperature values in °C/°F format. Test cylinders are held securely in place by quick-locking cams in the bath cover assembly. A separate stainless steel support rack is provided to hold the test cylinders after removal from the bath. Cold bath (24°C) has built-in coils for circulating exit air from the high temperature test cylinders prior to passing to a volume meter, and a separate coil for circulating cooling water or refrigerant when the ambient temperature exceeds the test temperature. Supplied with rubber stoppers and glass air outlet tubes for each cylinder. Bath controls are enclosed in a finished steel base with chemical resistant polyurethane enamel finish. Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options.
Contact your EXPOTECHUSA representative for information.

### Aircraft Lubricants Test

Employs more severe conditions – smaller sample, increased air flow, longer aeration period – to test the foaming characteristics of aircraft-turbine lubricants. Please contact us for specifications and ordering information.

**Included Accessories**
Test Cylinders, 1000mL (4)
Diffuser Stones, calibrated and certified (4)
Air Delivery Tube Assemblies (4)

Air Outlet Tubes (4)
Rubber Stoppers (4)
Bath Jars (2)
Support Rack (1)

**Specifications**
Conforms to the specifications of:
ASTM D892; IP 146; DIN 51566; FTM 791-3211, 791-3213*;
NF T 60-129
*Requires modifications to standard equipment.
Air Flow Rate: 94mL/min
Bath Temperature: 24°C (75°F) and 93.5°C (200°F) - Operator Variable
Bath Capacity: 9 gal (38.5L) each bath
Temperature Control:
Digital Setpoint and Displays °C/°F switchable
Built-in Over temperature Cut-off Protection

**Electrical Requirements**
115V, 50/60Hz, 16A
220-240V, 50/60Hz, 8A

**Dimensions** lxwxh,in.(cm)
32.25x15x31.25 (82x38x79.4)
Net Weight:
1844119: 108 lbs (49kg)
1844120: 118 lbs (53.5kg)

**Shipping Information**
Shipping Weight:
1844119: 217 lbs (98.4kg)
1844120: 227 lbs (103kg)
Dimensions:
1844119: 29.6 Cu. ft.
1844120: 33 Cu. ft.

## Foaming Characteristics Software

Foaming Characteristics "test intelligent" software simplifies the testing process by providing sequential test prompts for assisting the operator with each step of the test procedure, and provides timing for both the foaming test and foam settling for up to 4 samples simultaneously. The sophisticated Windows®-based software package features an easy-to-navigate operation, a straightforward user interface, minimal draw on Windows® memory resources, automatic real-time data acquisition via RS232 connection, and a timer / stopwatch feature for general laboratory use. The active zoom, pan, and trace feature allows the ability to change axes and the magnification of any graph sector to view data in greater detail. The final test data is exported with graphs and test parameters (user name, sample name, sample ID, test type) either directly to Microsoft® Excel, in ASCII file format for use with LIMS or any other spreadsheet programs, or directly to a printer with a test report according to ISO guidelines. Test data is saved in a database format for determining test averages, standard deviations, and ASTM test repeatability. The software package requires no PC hardware installation and includes the software installation CD and computer connection cables.

**Computer Requirements**
PC Processor: Intel® Pentium II or similar (minimum)
Processor Speed: 500 MHz or higher
Operating System: Windows® 98 SE, 2000, NT, ME, XP
Memory (RAM): 64 Mb RAM (128 Mb RAM recommended)
Hard Disk Space: 15 Mb free space (minimum)
Communication Ports: two RS232 ports
Other Software: Microsoft® Excel (97 or above)

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **1844119** | Foaming Characteristics Apparatus, Dual-Twin | 115V 50/60Hz |
| **1844125** | Foaming Characteristics Apparatus, Dual-Twin | 220-240V 50/60Hz |
| **1844120** | Foaming Characteristics Apparatus, Automatic Time Sequence | 115V 50/60Hz |
| **1844126** | Foaming Characteristics Apparatus, Automatic Time Sequence | 220-240V 50/60Hz |
| **2261619** | Foaming Characteristics Data Acquisition Software | |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2035396** | Air Pump, oil-less. Delivers 100% oil-free air. 115V, 50/60Hz |
| **2024097** | Air Pump, oil-less. Delivers 100% oil-free air. 220-240V, 50/60Hz |

| Catalog Number | Product Description |
|---|---|
| **2024101** | Wet Test Gas Meter. For volume measurements of air leaving the test cylinders. Note: One meter is required for each test cylinder. Not required for the 'Alternative Procedure' - Section 9.1 |
| **2024100** | Drying Tower. 300mm |
| **2024098** | Diffuser Stone Test Apparatus. For maximum pore diameter and permeability tests on diffuser stones. Consists of 90cm manometer, 500mL flask, flowmeter, graduate, delivery tube assembly and control valve. |
| **2261620** | Refrigerated Recirculator, 115V 60Hz, 8A. Use with foam test baths for 24°C tests (Sequence I and III). Microprocessor based digital control and quiet running compressor provide reliable operation and accurate control within ±0.5C. |
| **2023567** | Refrigerated Recirculator, 220-240V 50Hz, 4A |
| **2037926** | ASTM 12F Thermometer. Range: –5 to +215°F |
| **1793023** | ASTM 12C Thermometer. Range: –20 to +102°C |
| **2035054** | ASTM 41C Thermometer. Range: 98 to 152°C |
| **2024099** | Acrylic Heat Shield, with base. For high temperature bath on Dual-Twin Foam Test Apparatus. |
| **2035521** | Certified Diffuser Stone. Calibrated and certified for compliance with ASTM specifications for pore diameter and permeability. |
| **2035623** | Diffuser Stone, non-calibrated |
| **2037999** | Stainless Steel 'Mott' Diffuser |
| **1340239** | Test Cylinder. Replacement 1000mL cylinder. Includes retaining ring. |

## Foaming Characteristics Apparatus & Data Acquisition Software

### Test Method

Foaming of lubricating oils in applications involving turbulence, high speed gearing or high volume pumping can cause inadequate lubrication, cavitation, overflow and premature oxidation. The sample is blown with a controlled volume of air at different specified temperatures, including a newer high temperature test at 150°C. The resultant foam is measured at the end of each aeration period and at different intervals afterward. In the high temperature test, the amount of time required for the foam to collapse to "0" after the aeration period is also measured

### D892 and D6082 Dual Twin Foaming Characteristics Test Apparatus

For four tests in accordance with control ASTM D6082 and ASTM D892 specifications. Heated liquid bath features digital temperature control and an operating range to 150°C with four flowmeters to maintain the required flow rate of 94 and 200mL/min to the air diffusers. Requires the use of an external chiller to perform the Sequence I and III tests at 24°C.

**Specifications**

Conforms to the specifications of:
ASTM D892, D6082; IP 146; DIN 51566; FTM 791-3211; NF T 60-129
Temperature Control:
Digital Setpoint and Displays °C/°F switchable
Built-in Over temperature Cut-off Protection

**Included Accessories**

Test Cylinders, 1000mL (2)
Diffuser Stones, calibrated and certified (2)
Air Delivery Tube Assemblies (2)
Air Outlet Tube (2)
Rubber Stoppers (2)
Bath Jars (1)
Support Rack (1)

**Ordering Information**

| Model | Catalog Number | Electrical Requirements | Bath Temperature | Air Flow Rate | Bath Capacity | Dimensions lxwxh, in. (cm) | Shipping Information |
|---|---|---|---|---|---|---|---|
| D892/D6082 Dual Twin | 1844123 | 115V, 50/60Hz 15.5A | 150°C (302°F) | 94mL/min and 200mL/min | 9 gal (38.5L) each | 16.75x15x31.25 (42.5x38x79.4) Net Weight: 62 lbs (28.1kg) | Shipping Weight: 89 lbs (40.4kg) Dimensions: 16.3 Cu. ft. |
| | 1844124 | 220-240V, 50/60Hz 8.1A | (Operator Variable) | | | | |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| 2035396 | Air Pump, oil-less. Delivers 100% oil-free air. 115V, 50/60Hz |
| 2024097 | Air Pump, oil-less. Delivers 100% oil-free air. 220-240V, 50/60Hz |
| 2024101 | Wet Test Gas Meter. For volume measurements of air leaving the test cylinders. Note: One meter is required for each test cylinder. Not required for the 'Alternative Procedure' - Section 9.1 |
| 2024100 | Drying Tower. 300mm |
| 2024101 | Diffuser Stone Test Apparatus. For maximum pore diameter and permeability tests on diffuser stones. Consists of 90cm manometer, 500mL flask, flowmeter, graduate, delivery tube assembly and control valve. |
| 2261620 | Refrigerated Recirculator, 115V 60Hz, 8A. Use with foam test baths for 24°C tests (Sequence I and III). Microprocessor based digital control and quiet running compressor provide reliable operation and accurate control within ±0.5C. |
| 2023567 | Refrigerated Recirculator, 220-240V 50Hz, 4A |
| 2037926 | ASTM 12F Thermometer. Range: –5 to +215°F |
| 1793023 | ASTM 12C Thermometer. Range: –20 to +102°C |
| 2035054 | ASTM 41C Thermometer. Range: 98 to 152°C |
| 2024099 | Acrylic Heat Shield, with base. For high temperature bath on Dual-Twin Foam Test Apparatus. |
| 2035521 | Certified Diffuser Stone. Calibrated and certified for compliance with ASTM specifications for pore diameter and permeability. |
| 2035623 | Diffuser Stone, non-calibrated |
| 2037999 | Stainless Steel 'Mott' Diffuser |
| 1340239 | Test Cylinder. Replacement 1000mL cylinder. Includes retaining ring. |

# Water Separability Tester & Data Acquisition Software

## Test Method

The ability of a lubricating oil to separate from water and resist emulsification is an important performance characteristic for applications involving water contamination and turbulence. Water separability is determined by stirring equal volumes of water and sample together at a controlled temperature to form an emulsion and observing the time required for separation of the emulsion to occur. This method is suitable for petroleum oils and synthetic fluids

## Features and Benefits

- Tests emulsion characteristics of lubricating oils
- Seven sample capacity
- Movable digital stirrer with microprocessor control incorporates advanced features for flexibility and ease of operation
- Clear, illuminated heating bath provides excellent visibility
- Microprocessor temperature control with digital display and built in protection against over-temperature and low liquid level hazards
- Conforms to ASTM, ISO and related standards for water separability testing
- Optional sensor for direct measurement of sample temperature

## Water Separability Tester

Seven sample Water Separability Tester provides full visibility and microprocessor control of all functions for simplified, accurate testing of up to seven samples at a time. Use for specification of new oils and monitoring of in-service petroleum oils and synthetic fluids.

**Seven position heating bath** – A full visibility bath immerses seven 100mL cylinders at the proper depth per ASTM and ISO specifications. Sample cylinders are held securely in place by stainless steel supports inside the bath. A microprocessor based immersion circulator/heater assembly controls bath fluid temperature with greater than ±1°C accuracy and stability throughout the operating range of 25°C to 150°C. Large LED readouts display setpoint and actual temperatures in celsius or fahrenheit scale at the operator's option. For most samples, ASTM/ISO sample temperatures of 54°C and 82°C are attained within 10 minutes after placement of the test cylinders into the stabilized bath. Clear Pyrex™ bath has backlighting for excellent visibility when viewing emulsion separations in the test cylinders. Cut-off circuits for low water level and over-temperature conditions provide protection in the event of equipment malfunction. Finished aluminum cover assembly has built-in handles for removal when filling or cleaning the bath.

**Microprocessor sample stirrer** – To avoid sample movement, the sample stirrer housing pivots to each test position in the bath and locks securely in place at the required position in relation to the 100mL sample cylinder. The digital stirrer offers complete flexibility for test duration and stirring speed at the push of a button. Operating speed and count down time are prominently displayed on a large backlit LCD panel. A wide operating range of 60 - 1800 rpm permits in-house customized testing with ±1rpm accuracy, and the operator may select a stirring time of up to 99.99 minutes. At the end of the selected interval, the stirrer automatically shuts off and alerts the operator with visual signals that the settling period has commenced. For added convenience, all test parameters are stored in memory and repeated in subsequent tests until they are changed by the operator.

### Electrical Requirements

Conforms to the specifications of: ASTM D1401, D6074, D6158; ISO 6614; DIN 51599; FTM 791-3201
Stirrer Range: 60-1800rpm
Accuracy: ±1.0rpm
Drive: 1/10hp (75W), high torque
Bath Temperature Range: 25°C to 150°C
Control Stability: ±0.05°C
Capacity: seven (7) 100mL graduated cylinders
Construction: Pyrex™ glass jar 12x12 in. (30.5x30.5cm)
Medium: Water or white technical oil
Medium Capacity: 21.9L (5.8 gal)

### Electrical Requirements

115V 50/60Hz, 12A
220-240V 50/60Hz, 6A

### Included Accessories

Seven 100mL Cylinders

### Dimensions lxwxh,in.(cm)

12x12x38 (30.5x30.5x96.5)
Net Weight: 55 lbs (24.9kg)

### Shipping Information

Shipping Weight: 85 lbs (38.5kg)
Dimensions: 8.4 Cu. ft.



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## Water Separability Software

Water Separability Characteristics "test intelligent" software simplifies the testing process by providing sequential test prompts for assisting the operator with each step of the test procedure, and provides timing for the separation of the test sample and water. The timing results are then automatically computed to provide the test results in ASTM notation for water separability. The sophisticated Windows®-based software package features an easy-to-navigate operation, a straightforward user interface, minimal draw on Windows® memory resources, and an additional timer / stopwatch feature for general laboratory use. The active zoom, pan, and trace feature allows the ability to change axes and the magnification of any graph sector to view data in greater detail. The final test data is exported with graphs and test parameters (user name, sample name, sample ID, test type) either directly to Microsoft® Excel, in ASCII file format for use with LIMS or any other spreadsheet programs, or directly to a printer use with LIMS or any other spreadsheet programs, or directly to a printer with a test report according to ISO guidelines. Test data is saved in a database format for determining test averages, standard deviations, and ASTM test repeatability. The software package requires no PC hardware installation and includes the software installation CD.

**Computer Requirements**
PC Processor: Intel® Pentium II or similar (minimum)
Processor Speed: 500 MHz or higher
Operating System: Windows® 98 SE, 2000, NT, ME, XP
Memory (RAM): 64 Mb RAM (128 Mb RAM recommended)
Hard Disk Space: 15 Mb free space (minimum)
Other Software: Microsoft® Excel (97 or above)

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2054064** | Water Separability Tester | 115V 60Hz |
| **2255124** | Water Separability Tester | 230V 50Hz |
| **2255125** | Water Separability Tester | 230V 60Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2038041** | Cylinder, 100mL. Graduated from 5 to 100mL with 1.0mL divisions. |
| **2035664** | ASTM 19F Thermometer. Range: 120 to 134°F |
| **2035733** | ASTM 19C Thermometer. Range: 49 to 57°C |
| **2035978** | ASTM 21F Thermometer. Range: 174 to 188°F |
| **2036032** | ASTM 21C Thermometer. Range: 79 to 87°C |
| **2035317** | PTFE Policeman |
| **2038102** | Test Tube Rack |

## Demulsibility Characteristics Bath

### Test Method

Tests the ability of medium to high viscosity oils to separate from water when water contamination and turbulence are encountered. The sample is stirred together with distilled water for 5 minutes at constant temperature. After a specified settling period, the degree of separation is measured by volume and the percentage of water in oil is determined. For lighter oils and synthetic fluids, the ASTM D1401 Water Separability Test is used.

### Features and Benefits

- Conforms to the specifications of ASTM D2711 and DIN 51353
- Variable 150-8000rpm stirrer speed
- Choice of digital or analog bath models

### Demulsibility Characteristics Bath

Stirrer – Complete stirrer assembly per Fig. 1 and 2 of ASTM D2711, including high speed 1/15hp 8000rpm drive motor, stainless steel



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propeller shaft, top, center and bottom bearings, and steel motor housing with positioning plate. Entire assembly mounts vertically in 2035415/2036848 Constant Temperature Bath. Built-in tachometer disc allows for precise stirrer speed adjustment.
(Order tachometer separately).

**Constant Temperature Baths** – Standard model holds two 2036501 Stirrers and two 2037254 Separatory Funnels in proper alignment for demulsibility characteristics testing. Stirrers mount securely on a stainless steel support plate having brackets for testing and drainage positions. Separate motor speed controls (150-8000rpm range) are provided for each stirrer. All wetted parts are constructed of stainless steel. Order thermometer separately.

**Visibility Baths** – Visibility model has microprocessor digital temperature control with dual LED displays for setpoint and actual temperatures and an illuminated bath interior with window for viewing sample cylinders. A separate digital LED speed control is provided for each stirrer.

**Specifications**
Conforms to the specifications of: ASTM D2711 and DIN 51353
Capacity: Two (2) sample-water mixtures
Maximum Temperature: 212°F (100°C)
Temperature Control: Electric solid state or microprocessor digital control with LED display
Bath Medium:
10.7 gal (40.4L) water for 2035415/2036848
9 gal (38.5L) water for 2035166/2038263

**Electrical Requirements**
115V 50/60Hz
220-240V 50/60Hz

**Dimensions** dia.xh,in.(cm)
14.75x35.5 (37x90)
Net Weight: 72 lbs (32.6kg)

**Shipping Information**
Shipping Weight 133 lbs (60.3kg)
Dimensions: 25.4 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2035415** | Demulsibility Characteristics Bath | 115V, 50/60Hz |
| **2036848** | Demulsibility Characteristics Bath | 220-240V, 50/60Hz |
| **2036501** | Stirrer * | 115V, 50/60Hz |
| *Suitable for use with 2036501 & 2036848 | | |
| **2035166** | Demulsibility Characteristics Visibility Bath | 115V, 50/60Hz |
| **2038263** | Demulsibility Characteristics Visibility Bath | 220-240V, 50/60Hz |
| **2036449** | Stirrer ** | 115V, 50/60Hz |
| **Suitable for use with 2036449 & 2038263 | | |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2037254** | Separatory Funnel With 0-500mL graduations. Meets ASTM specifications. |
| **2037616** | Solvent Tank. Immerses stirrer assembly for convenient cleaning after testing. |

| Catalog Number | Product Description |
|---|---|
| **2035756** | Forced Warm Air Dryer, 115V 50/60Hz. High output 1400W dryer and brass cylinder mounted on a sturdy base. Rapidly dries stirrer assembly after cleaning. |
| **2035756** | Forced Warm Air Dryer, 220-240V 50/60Hz |
| **2036233** | Sampling Gauge and Centering Device. Per Fig. X1 of ASTM D2711. Aids in accurately obtaining 50mL samples from separatory funnels for the 'percent water in oil' determination. |
| **2036887** | Digital Tachometer. Hand held non-contact LCD tachometer takes measurements up to 3 ft. away with +1 rpm accuracy. Supplied with four 1.5V AA batteries. |
| **1793619** | ASTM 9F Thermometer. Range: 20 to 230°F |
| **2036580** | ASTM 9C Thermometer. Range: -5 to +110°C |
| **2035050** | Conditioning Bath, 115V 50/60Hz. Constant temperature water bath holds 8 separatory funnels in two removable 4-unit racks for conditioning prior to testing in Demulsibility Apparatus. Includes microprocessor digital temperature control, automatic water level control, and gabled cover. |
| **2038177** | Conditioning Bath, 220-240V, 50/60Hz |

## Air Release Value Apparatus & Data Acquisition Software

### Test Method

The ability of a turbine, hydraulic, or lubricating oil to separate entrained air is a key performance characteristic in applications where agitation causes a dispersion of air bubbles in the oil. To determine air release properties, the sample is heated to a specified test temperature and blown with compressed air. After the air flow is stopped, the time required for the air entrained in the oil to reduce in volume to 0.2% is the air bubble separation time.

### Features and Benefits

- Complete instrument and data acquisition system exclusively designed for conducting ASTM D3427, IP 313 and related test methods
- Powerful software system for Windows®-based PC platforms automates sample density measurements as well as the calculation of the air release value, the first order rate of air release, and the volume percent air versus time
- High accuracy temperature control with digital setpoint and display

- Digital control panel leads user from start to finish of test operation
- Automatic calculation of final sample density for determination of air release value
- Redundant over temperature protection circuitry assures safe operation

## Air Release Value Apparatus

Air Release Value Apparatus consists of a test vessel and air flow control equipment for delivering heated air at the specified flow rate to a lubricating oil sample maintained at constant temperature. Microprocessor-based control panel guides user from start to finish of the test procedure, calculates sample target density, and provides the time operation for measuring the air release value of the test sample.

The system includes drying oven for warming the test oil at temperatures of up to 100°C; circulating bath with digital temperature controller and air bath for sinker; compressed air heater with digital temperature controller, over temperature and overpressure protection; pressure gauge; thermometer; jacketed sample tube with air inlet/outlet tubes and baffle plate.

**Specifications**
Conforms to the specifications of: ASTM D3427; IP 313; DIN 51381; NF E 48-614
Temperature Range: ambient to 75°C (167°F

**Included Accessories**
Jacketed Test Vessel
ASTM 12C Thermometer
Sinkers, 5mL and 10mL
Drying oven
Pressure gauge
Circulating Bath
Air Bath for Sinker

Balance
Platinum Wire

**Electrical Requirements**
115V 60Hz, 3.0A
230V 50Hz, 1.5A
230V 60Hz, 1.5A

**Dimensions** lxwxh,in.(cm)
24x28x38.25 (61x71x97)
(Air Release Value Apparatus only)
Net Weight for complete system: 225 lbs (103kg)

**Shipping Information**
Shipping Weight for complete system: 300 lbs (136kg)

## Air Release Value Software

Air Release Software automatically calculates the sample target density/mass and then measures the air release value, providing hands-free data acquisition. First-order air release rate constant and the volume percent of air versus time are also determined for more detailed test analysis than required by ASTM D3427 or IP 313 test methods. The sophisticated Windows®-based software package features an easy-to-navigate operation, a straightforward user interface, minimal draw on Windows® memory resources, and automatic real-time data acquisition via RS232 connection. The "test intelligent" software simplifies the testing process by providing sequential test prompts for guiding the operator with each step of the test procedure. The software package requires no PC hardware installation and includes the software installation CD and computer connection cables

**Computer Requirements**
PC Processor: Intel® Pentium II or similar (minimum)
Processor Speed: 500 MHz or higher
Operating System: Windows® 98 SE, 2000, NT, ME, XP
Memory (RAM): 64 Mb RAM (128 Mb RAM recommended)
Hard Disk Space: 15 Mb free space (minimum)
Communication Ports: two RS232 ports
Other Software: Microsoft® Excel (97 or above)

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2059179** | Air Release Value Apparatus | 115V, 50/60Hz |
| **2043190** | Air Release Value Apparatus | 220-240V, 50/60Hz |
| **2043191** | Air Release Value Apparatus | 115V, 50/60Hz |
| **2043195** | Data Acquistion Software Package | |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2036452** | Jacketed Test Vessel |

## Oxidation Stability Bath, RBOT / TFOUT

### Test Method

The RBOT procedure employs severe oxidation conditions to rapidly determine oxidation stability. Suitable for both new and in-service oils, the RBOT method is applicable to many types of petroleum oils. The sample is oxidized in the presence of water and a copper catalyst in a stainless steel pressure vessel under an initial pressure of 90psi (620kPa). Pressure inside the vessel is recorded electronically or mechanically while the vessel is rotated at 100rpm at constant temperature, and the amount of time required for a specified drop in pressure is the oxidation stability of the sample. A variation of the RBOT method is the "Thin Film Oxidation Uptake Test" (TFOUT) for gasoline automotive engine oils.



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## Features and Benefits

- Two, three and four-pressure vessel models
- Conforming to ASTM requirements for RBOT and TFOUT testing

## Oxidation Stability Bath, RBOT / TFOUT

Constant temperature bath rotates oxidation pressure vessels at 100rpm at an angle of 30° in accordance with ASTM specifications. Includes drive system and oil bath with electronic solid state temperature control. Meets ASTM requirements for heat transfer capability and temperature control precision.

A convenient carriage arrangement allows the oxidation vessels to be inserted quickly and securely in the drive system. A strong magnet holds the vessel in place while locating pins in the carriage engage the base of the vessel. PTFE guides support the pressure vessel stem for added stability. If the vessel becomes obstructed for any reason, the magnetic carriage releases it to prevent damage. A chain and sprocket drive system powered by a heavy duty capacitor start motor rotates the vessel carriages at 100rpm. Drive shafts ride on PTFE fluorocarbon bearings which provide extended service and are compatible with silicone heat transfer fluids and other types of bath oils.

Bath temperature is controlled within ASTM specified limits by an electronic solid state controller with °C/°F switchable digital setpoint and display. Over temperature protection is provided by a built-in limit control that automatically interrupts power to the bath when bath liquid temperature exceeds 16.7°C (30°F) above the temperature setting or 177°C (350°F). Power must then be manually restored by the operator after checking the cause of the problem. Pressure vessel carriage vanes circulate the bath oil during testing to ensure temperature uniformity, and an auxiliary stirrer can be operated between tests to prevent sludging of non-silicone bath oils.

The bath interior is constructed of welded stainless steel and is fully insulated. A hinged section of the bath cover provides easy access to the vessel carriages. Vapor barriers in the cover close around the vessel stems to contain vapors from the hot bath medium. A chemical resistant polyurethane finish protects the bath exterior and control cabinet.

### Specifications

Conforms to the specifications of: ASTM D2112, D2272, D4742; IP 229
Capacity: 2, 3 or 4 oxidation pressure vessels
Maximum Temperature: 200°C (392°F)
Control Stability: ±0.02°C (±0.04°F)
Heater Range:
2 and 3-pressure vessel models: 0-2750W
4-pressure vessel models: 0-3750W
Drive System: 100rpm positive drive transmission powered by a continuous duty 1/2hp ball bearing motor with built-in gear reducer
Recommended Bath Medium: high temperature silicone heat transfer fluid (1794810 or 2042824)

**Ordering Information**

| Catalog Number | Capacity | Electrical Requirements | Bath Capacity gal (L) | Dimensions lxwxh,in.(cm) | Net Weight | Shipping Weight, Dimensions |
|---|---|---|---|---|---|---|
| **1844147** | 2 oxidation vessels | 220-240V 60Hz, 17.17A | 18 (68) | 28x26x33 (71x66x84) | 237 lbs (107.5kg) | 356 lbs (161.5kg) 25.3 Cu. ft. |
| **1844148** | | 220-240V 50Hz, 17.17A | | | | |
| **1844149** | 3 oxidation vessels | 220-240V 60Hz, 17.17A | 25 (95) | 37x26x33 (94x66x84) | 284 lbs (129kg) | 416 lbs (188.7kg) 32 Cu. ft. |
| **1844150** | | 220-240V 50Hz, 17.17A | | | | |
| **1844151** | 4 oxidation vessels | 220-240V 60Hz, 21.5A | 32 (121) | 46x26x33 (117x66x84) | 375 lbs (170kg) | 542 lbs (245.9kg) 40.3 Cu. ft. |
| **1844153** | | 220-240V 50Hz, 21.5A | | | | |



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## Accessories

| Catalog Number | Product Description |
|---|---|
| **Bath Thermometers** | |
| **2038217** | IP 37C Thermometer. For RPVOT (RBOT) method. Range: 144 to 156°C |
| **1872666** | ASTM 96C Thermometer. For ASTM D2112 method. Range: 120 to 150°C |
| **2037005** | ASTM 100C Thermometer. For TFOUT method. Range: 145 to 205°C |
| **Sample Beakers** | |
| **1844143** | RBOT Sample Beaker. Borosilicate glass, 175mL. Meets ASTM D2112, D2272 specifications |
| **1844144** | TFOUT Sample Container. Borosilicate glass. Meets ASTM D4742 specifications |
| **Oxygen Charging Accessories** | |
| **2022435** | Charging Hose. 6 ft (1.8m), with connections. |
| **2022436** | Quick Connect Coupling, for charging hose. |
| **2022437** | Quick Connect Couplings, for oxidation pressure vessel. |
| **2035051** | Oxygen Pressure Regulator. |
| **Oxidation Pressure Vessel Accessories** | |
| **2036034** | Silicone O-ring. Replacement seal for pressure vessel lid-body connection. |
| **2035105** | Sample Beaker Cover (PTFE disk). |
| **2037124** | TFOUT Sample Beaker Cover (PTFE disk). |
| **2035311** | Spring. Inserts in pressure vessel to hold RPVOT (RBOT) beaker and cover in place. |
| **2035758** | Spring. Inserts in pressure vessel to hold TFOUT container and cover in place. |
| **Pressure Vessel Support Rack** | |
| *Securely holds vessel-recorder assembly in an upright position. Convenient for assembling and disassembling vessel. Equipped with drainage trough for bath oil remaining on the vessel exterior after testing.* | |
| **1844141** | Pressure Vessel Support Rack, 2-Unit. |
| **2038084** | Pressure Vessel Support Rack, 3-Unit. |
| **1844140** | Pressure Vessel Support Rack, 4-Unit. |
| **Pressure Recorder** | |
| *Records pressure inside oxidation bomb on 24-hour charts. Range 0 to 200psi, accurate to within 2% of scale range, 24-hour spring wound chart movement. Housed in a finished metal case. Includes cartridge pen.* | |
| **2038151** | Pressure Recorder, 24-hour. |
| **2035843** | Replacement Cartridge Pen. |
| **2035460** | Recorder Chart, 24-hour. Box of 60 charts |
| **Copper Catalyst for RBOT Method** | |
| **1844142** | Copper Catalyst Coil. Prepared in accordance with ASTM specifications and packed in a sealed glass container with nitrogen atmosphere. Ready to use. |
| **1186720** | Copper Catalyst Wire. 1.63mm electrolytic copper wire in 500 ft (152m) lengths.. |
| **1844137** | Winding Mandrel. Machined aluminum mandrel for winding copper wire into coils meeting ASTM specifications. Mounts on 1844138/1844139 Drive Unit. |
| **1844138** | Drive Unit for Winding Mandrel. Slow speed gear motor mounted on a sturdy base. Facilitates coil winding procedure. 115V 50/60Hz |
| **1844139** | Drive Unit for Winding Mandrel. Similar to 1844138 but for operation on 220-240V |

| Catalog Number | Product Description |
|---|---|
| **Catalyst Package for TFOUT Method** | |
| **1844145** | Catalyst Package B. For simulating IIIE engine test. Includes 5 catalyst packages, NIST certified. |
| **1844146** | Catalyst Package B. For simulating IIIE engine test. Includes 3 catalyst packages. |
| **Oxygen Stand Assembly** | |
| **1844152** | Oxidation Stand Assembly. For 1844151 & 1844153 |

## Oxidation Pressure Vessel, RBOT / TFOUT

### Test Method

The RBOT procedure employs severe oxidation conditions to rapidly determine oxidation stability. Suitable for both new and in-service oils, the RBOT method is applicable to many types of petroleum oils. The sample is oxidized in the presence of water and a copper catalyst in a stainless steel pressure vessel under an initial pressure of 90psi (620kPa). Pressure inside the vessel is recorded electronically or mechanically while the vessel is rotated at 100rpm at constant temperature, and the amount of time required for a specified drop in pressure is the oxidation stability of the sample. A variation of the RBOT method is the "Thin Film Oxidation Uptake Test" (TFOUT) for gasoline automotive engine oils.

### Features and Benefits

- Polished stainless steel construction
- Can be converted for use in the Thin Film Oxidation Uptake Test (TFOUT)

### Oxidation Pressure Vessel, RBOT / TFOUT

Consists of pressure vessel body, cap and stem with inlet needle valve in accordance with ASTM specifications. Vessel holds one borosilicate glass sample container between two PTFE discs. Closure ring tightens by hand to seal cap to pressure vessel body. Vessel connects to pressure recorder or rotary transducer and rotates on magnetic carriage in RBOT bath. Withstands working pressure of 500psi (3450kPa) per ASTM specifications. Stainless steel construction ensures proper rate of heat transfer. Closure ring is constructed of chrome plated steel. Includes PTFE fluorocarbon wear disc and sample container cover disc.

**Specifications**
Conforms to the specifications of: ASTM D2112, D2272, D4742; IP 229

**Ordering Information**

| Catalog Number | Product Description |
|---|---|
| **2038144** | Oxidation Pressure Vessel |
| **2036400** | Aluminum Insert. Converts standard 2038144 Oxidation Pressure Vessel for use in the TFOUT method. |



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## Oxidata™ Data Acquisition Software Package

### Test Method

The RBOT procedure employs severe oxidation conditions to rapidly determine oxidation stability. Suitable for both new and in-service oils, the RBOT method is applicable to many types of petroleum oils. The sample is oxidized in the presence of water and a copper catalyst in a stainless steel pressure vessel under an initial pressure of 90psi (620kPa). Pressure inside the vessel is recorded electronically or mechanically while the vessel is rotated at 100rpm at constant temperature, and the amount of time required for a specified drop in pressure is the oxidation stability of the sample. A variation of the RBOT method is the "Thin Film Oxidation Uptake Test" (TFOUT) for gasoline automotive engine oils.

### Features and Benefits

- Electronic pressure measurement systems exclusively designed for RPVOT (formerly RBOT), TFOUT and other ASTM oxidation test methods
- Automatic end-point detection for RPVOT (formerly RBOT), TFOUT, and D525 test methods
- Powerful software system for PC platforms operating in Windows® 98 SE, 2000, NT, ME, and XP environments
- Monitors up to twelve pressure channels and four temperature channels
- Displays average bath temperature and pressure readings in real-time
- *Readily installed on most manufacturer's test apparatus*

## Oxidata™ Data Acquisition Software Package

Oxidata™ is an advanced data acquisition system used to measure test data in real-time for fuel and lubricant ASTM oxidation tests. The system features pressure measurement transducers coupled with a sophisticated Windows®-based software package for acquiring pressure and temperature versus time data to a high degree of accuracy and precision. Oxidata™ monitors up to twelve samples simultaneously with a graphical display of the test results. An active zoom, pan, and trace option provides the ability to view the test results with closer scrutiny both during and after the data acquisition process. For ultimate user flexibility, each pressure channel can be independently configured for any of the applicable ASTM standard test methods or a user-defined test method without compromising either the independent start/stop capability or the accuracy of the other channels.

Oxidata™ software features an easy-to-navigate operation and a straightforward user interface. The "test intelligent" software simplifies the testing process by providing sequential test prompts for assisting the operator with each step of the test procedure. It also includes an additional timer/stopwatch available for any purpose. For each test, the user name, sample name and identification, and test type are recorded. The test data is acquired in user specified time intervals, plotted on screen in real-time, and can be automatically saved to the hard drive during the test to prevent any loss of valuable data. The software features multiple display options which include the ability to view the status of all twelve pressure channels simultaneously, to display the complete graph of any one channel, or to simultaneously view four channels in graphical format. In addition to data acquisition, the PID temperature controller located on the oxidation bath can be fully controlled through the software, including setting the bath temperature, temperature calibration, °C/°F toggle, and recording the temperature data versus time in graphical format. The active zoom, pan, and trace feature allows the ability to change axes and the magnification of any plot sector on any pressure or temperature channel to view data in greater detail. The final test data is exported with graphs and test parameters either directly to Microsoft® Excel, in ASCII file format for use with LIMS or any other spreadsheet programs, or directly to a printer with a test report according to ISO guidelines. Test data is saved in a database format and can be analyzed again at any future time. This feature also provides reprocessing of data acquired with previous versions of the Oxidata™ software package, and it's easy to upgrade from the previous versions.



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Each Oxidata™ package requires no PC hardware installation and includes transducers, bomb couplings, RTD probe assembly, data acquisition box with USB port connector, software, and mounting and connecting hardware. Systems are available in two, three and four pressure vessel configurations. Additional channels can be added for up to a total of twelve pressure channels and four temperature channels.

## Oxidata™ Features and Specifications

- On-screen, real-time monitoring of up to twelve samples simultaneously
- Test results directly plotted on-screen for instant monitoring or print out of results
- Menu options for fuel, oil, and grease ASTM oxidation tests including D525, D942, D2112 and D2272 (RPVOT – formerly RBOT), and D4742 (TFOUT)
- Programmable automatic end-point detection with graphical representation for customizing test methods
- Each channel can be independently configured and operated with different start/stop times and ASTM test methods
- Zoom, pan, and trace feature allows for magnification of any plot area on any channel for a more detailed study
- Monitors and reports temperatures of as many as four baths simultaneously using accessory RTD probes, and calculates and displays average temperature for each bath
- Exports test data with graphs and test parameters directly to Microsoft® Excel or in ASCII file format for use with LIMS or any other spreadsheet programs
- Temperature and pressure calibration utility included in software package
- Data can be routinely saved directly to the hard drive during testing to prevent loss of valuable data
- Operates in Windows® 2000 or higher

### Included Accessories

Rotary pressure transducers (connects directly to bomb)
Data acquisition box with USB connector
Oxidata™ software
Multiplexer
RTD probe assembly
Mounting bracket
Connecting cables and hardware

### Computer Requirements

Processor: Intel® Pentium II or similar (minimum)
Memory (RAM): 256MB or higher
Speed: 500 MHz or higher
Windows® 2000 or higher
Disk Space: 15 MB free space (minimum)
Communications Port: One USB port
Other Software: Microsoft® Excel (97 or above)
One RS232 port for temperature controller (optional)

### Ordering Information

| Catalog Number | Model | Product Description | Electrical Requirements |
|---|---|---|---|
| **2035145** | 2-Unit System | Oxidata™ Pressure Measurement System Windows® XP version for RPVOT (RBOT) and TFOUT | 115V 60Hz |
| **2022438** | 2-Unit System | Oxidata™ Pressure Measurement System Windows® XP version for RPVOT (RBOT) and TFOUT | 220-240V 50/60Hz |
| **2037659** | 3-Unit System | Oxidata™ Pressure Measurement System Windows® XP version for RPVOT (RBOT) and TFOUT | 115V 60Hz |
| **2036712** | 3-Unit System | Oxidata™ Pressure Measurement System Windows® XP version for RPVOT (RBOT) and TFOUT | 220-240V 50/60Hz |
| **2035836** | 4-Unit System | Oxidata™ Pressure Measurement System Windows® XP version for RPVOT (RBOT) and TFOUT | 115V 60Hz |
| **2035684** | 4-Unit System | Oxidata™ Pressure Measurement System Windows® XP version for RPVOT (RBOT) and TFOUT | 220-240V 50/60Hz |

*To upgrade existing Windows® 95/98-based Oxidata™ systems to Version 7.2 for Windows® XP, order a USB upgrade kit. The kit includes a USB port communication box, Oxidata™ software CD, and computer cables. Does not include rotary pressure tranducers or bath mounting equipment with the upgrade kit.*

| Ordering Information | | | |
|---|---|---|---|
| **Catalog Number** | **Model** | **Product Description** | **Electrical Requirements** |
| **2036425** | 2-Unit System | Oxidata™ Pressure Measurement System Upgrade from Windows® 95/98 to XP for RPVOT (RBOT) and TFOUT | 115V 60Hz |
| **2037651** | 2-Unit System | Oxidata™ Pressure Measurement System Upgrade from Windows® 95/98 to XP for RPVOT (RBOT) and TFOUT | 220-240V 50/60Hz |
| **2036100** | 3-Unit System | Oxidata™ Pressure Measurement System Upgrade from Windows® 95/98 to XP for RPVOT (RBOT) and TFOUT | 115V 60Hz |
| **2037982** | 3-Unit System | Oxidata™ Pressure Measurement System Upgrade from Windows® 95/98 to XP for RPVOT (RBOT) and TFOUT | 220-240V 50/60Hz |
| **2036978** | 4-Unit System | Oxidata™ Pressure Measurement System Upgrade from Windows® 95/98 to XP for RPVOT (RBOT) and TFOUT | 115V 60Hz |
| **2035359** | 4-Unit System | Oxidata™ Pressure Measurement System Upgrade from Windows® 95/98 to XP for RPVOT (RBOT) and TFOUT | 220-240V 50/60Hz |

*To upgrade existing Windows® DOS-based Oxidata™ systems to Version 7.2 for Windows® XP, order a retrofit kit. The kit includes a data acquisition box with USB port connector, Oxidata™ software CD, and computer cables. Does not include rotary pressure tranducers or bath mounting equipment with the retrofit kit.*

| Ordering Information | | | |
|---|---|---|---|
| **Catalog Number** | **Model** | **Product Description** | **Electrical Requirements** |
| **1844154** | 2-Unit System | Oxidata™ Pressure Measurement System Retrofit from Windows® DOS to XP for RPVOT (RBOT) and TFOUT | 115V 60Hz |
| **1844157** | 2-Unit System | Oxidata™ Pressure Measurement System Retrofit from Windows® DOS to XP for RPVOT (RBOT) and TFOUT | 220-240V 50/60Hz |
| **1844155** | 3-Unit System | Oxidata™ Pressure Measurement System Retrofit from Windows® DOS to XP for RPVOT (RBOT) and TFOUT | 115V 60Hz |
| **1844158** | 3-Unit System | Oxidata™ Pressure Measurement System Retrofit from Windows® DOS to XP for RPVOT (RBOT) and TFOUT | 220-240V 50/60Hz |
| **1844156** | 4-Unit System | Oxidata™ Pressure Measurement System Retrofit from Windows® DOS to XP for RPVOT (RBOT) and TFOUT | 115V 60Hz |
| **1844159** | 4-Unit System | Oxidata™ Pressure Measurement System Retrofit from Windows® DOS to XP for RPVOT (RBOT) and TFOUT | 220-240V 50/60Hz |

| Ordering Information | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2037321** | Rotary Transducer. Includes electronic transducer and rotating stainless steel housing |
| **2038197** | RTD Kit. For monitoring the temperature of an additional bath. |

# High Temperature Oxidation Bath, Convertible

## Test Method

Various methods are available for testing the resistance to oxidation and/or the corrosiveness of lubricants, insulating oils, hydraulic oils and distillate fuel oils. The samples are subjected to a metered flow of air at elevated temperatures, sometimes in the presence of a metal catalyst.

## Features and Benefits

- Conforms to various ASTM, Federal and International Standards
- Removable racks hold different types of glassware for different tests
- Equipped with flow meters or digital mass flow controls to measure and control the required flow rates
- Microprocessor digital temperature control

## High Temperature Oxidation Bath, Convertible

High temperature liquid bath for oxidation stability and corrosiveness tests at temperatures of up to 200°C. Available in different configurations for convertibility between several oxidation stability and corrosivity test methods including Cummins oxidation test. Removable rack/top plate assemblies remove and install with minimum effort to easily convert the bath between test methods. For most test methods, twelve sets of glassware can be accommodated in each rack assembly. Select flow meters or digital mass flow control to maintain air flow at the required rates. Microprocessor PID control provides quick temperature stabilization without overshoot, and the bath is protected by an over-temperature control circuit that interrupts power should bath temperature exceed a programmed cut-off point. Dual LED displays provide actual and setpoint temperature values in °C/°F format.

*Communication software (RS232, etc.) ramp-to-set and other enhanced features are available as extra cost options.*

*Contact your* EXPOTECH USA *representative for information.*

Capacity: Twelve (12) sets of glassware
(Ten (10) sets of glassware for ASTM D5968, FTM 791-5307, and FTM 791-5308)
Temperature Range: Ambient to 200°C
Temperature Control Accuracy: 0.2°F (0.1°C)
Bath Medium: Silicone heat transfer fluid
Flow Rate: As specified for ASTM or applicable specifications

**Electrical Requirements**
115V 50/60Hz, Single Phase, 27.3A
220-240V 50/60Hz, Single Phase, 14.6A

**Dimensions** lxwxh,in.(cm)
Bath (without glassware): 25.5x24x42 (65x61x107)

**Shipping Information** (without glassware)
Shipping Weight: 213 lbs (96.6kg)
Dimensions: 29 Cu. ft.

**Specifications**
Conforms to the specifications of *: ASTM D943, D2274, D2440, D2893, D4310, D4636, D5968; UOT**, DIN 51586, DIN 51587, DIN 51394; FTM 791-5307, FTM 791-5308
*With the appropriate glassware rack and flow control equipment installed.
**Modified versions of this equipment are available for UOT test method.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2037207** | High Temperature Oxidation Bath, Convertible | 115V 50/60Hz |
| **2035058** | High Temperature Oxidation Bath, Convertible | 220-240VV 50/60Hz |

| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2037068** | Sample Rack for D943, D2274, D2892, D4310 testing |
| **2036581** | Sample Rack for D2440 testing |
| **2035925** | Sample Rack for D4636, D5968 testing |
| **2035998** | Flowmeter Stand with Flowmeters for D943, D2274, D2440, D4310 testing (range 3 ±0.1 L/hr) |
| *To order glassware and other accessories please refer to the pages in this section of the catalog that correspond to the test methods that you will be following.* | |

## Oxidation Stability Apparatus, 8- & 12-Unit

### Test Method

Evaluates oxidation stability by subjecting the sample to a temperature of 95°C in the presence of oxygen or dry air. For inhibited mineral oils, the sample is reacted with oxygen in the presence of water and an iron-copper catalyst.

### Features and Benefits

• Conforming to ASTM and related test method specifications

### Oxidation Stability Apparatus, 8- & 12-Unit

Constant temperature baths with solid state temperature control, calibrated flowmeters and condenser water manifold for oxidation stability tests on fuels and lubricants. Individual flowmeters and control valves for each oxidation cell deliver air flow at the rate of 3L/h. Condenser water manifold has individual control valves for each cell. Microprocessor PID control provides quick temperature stabilization without overshoot, and the bath is protected by a redundant overtemperature control circuit that interrupts power should bath temperature exceed a programmed cut-off point. Display provides actual setpoint temperature values in °C/°F format. Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Double-wall insulated baths are equipped with electronic solid state temperature control, copper immersion heaters and a 1/20 hp circulation stirrer to maintain temperature uniformity of ±0.2°C. Stainless steel bath interior has a built-in support rack and overflow/drain to immerse the test cells at the required depth. Order oxidation cell glassware and accessories separately.

**Specifications**

Conforms to the specifications of: ASTM D943, D2274, D2893*, D4310, D6158; AOCS CD12-57**, DIN 51586, DIN 51587; ISO 4263, ISO 12205

*Modified versions of this equipment are available for ASTM D2893.

**"Oxidation Characteristics of Extreme Pressure Lubricating Oils" and AOCS CD12-57 "Fat Stability-Active Oxygen Method."

Information will be furnished upon request.

Test Capacity: 8 or 12 oxidation cells

Temperature Range: ambient to 212°F (100°C)

Temperature Control Stability: ±0.2°F (±0.1°C)

Bath Medium: white technical oil



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Bath Capacity:
8-place model: 10 gal (37.8L)
12-place model: 19 gal (71.9L)

**Electrical Requirements**
8-place model:
115V, 50/60Hz, Single Phase, 13.0A
220-240V, 50/60Hz, Single Phase, 6.8A
12-place model:
115V, 50/60Hz, Single Phase, 32.6A
220-240V, 50/60Hz, Single Phase, 17.0A

**Dimensions** lxwxh,in.(cm)
8-place model: 17.5x25x42 (44x64x107)
12-place model: 25.5x24x42 (65x61x107)

**Shipping Information:**
Shipping Weight:
8-place model: 137 lbs (62.1kg)
12-place model: 213 lbs (96.6kg)
Dimensions:
8-place model: 29 Cu. ft.
12-place model: 29 Cu. ft

## Ordering Information

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2037818** | Oxidation Stability Apparatus, 8-Unit | 115V 50/60Hz |
| **2024153** | Oxidation Stability Apparatus, 8-Unit | 220-240V 50/60Hz |
| **2035645** | Oxidation Stability Apparatus, 12-Unit | 115V 50/60Hz |
| **2035645** | Oxidation Stability Apparatus, 12-Unit | 220-240VV 50/60Hz |

## Accessories

| Catalog Number | Product Description |
|---|---|
| ASTM D943, D4310, and D2274 Accessories<br>For ASTM D2274, order one each 2024154 Oxygen Delivery Tube, 2024162 Oxidation Test Tube, and 2024163 Condenser for each cell. | |
| **2035570** | Oxidation Cell Assembly for ASTM D943 and D4310. Includes oxidation cell, condenser, oxygen delivery tube, thermometer bracket, oil level indicator strip, syringe sampling tube, sampling tube holder, spacer |
| **2024154** | Oxygen Delivery Tube |
| **2024162** | Oxidation Test Tube |
| **2024163** | Condenser |
| **2035478** | Thermometer Bracket |
| **2036702** | Oil Level Indicator Strip |
| **2035718** | Syringe Sampling Tube Holder |
| **2037070** | PTFE Stopper |
| **2037543** | Syringe Sampling Spacer |
| **2035321** | Syringe Sampling Tube |
| **2037766** | O-Rings |
| Iron-Copper Catalyst. For ASTM D943 and D4310. | |
| **2037065** | Catalyst Coil. Low-metalloid steel wire and electrolytic copper wire wound in a double spiral conforming to ASTM specifications. Packed in a sealed glass tube with a nitrogen atmosphere. Ready for use. |
| **2038173** | Wire Coiling Mandrel. Mounts on bench for winding steel and copper wire into catalyst coils meeting ASTM specifications. |
| **2035258** | Steel Wire. Low metalloid steel wire, 0.0625” (1.59mm) diameter, for catalyst coils. Supplied in 1000 ft (304.8m) lengths. |
| **2038079** | Copper Wire. Electrolytic copper wire, 0.064” (1.63mm) diameter, for catalyst coils. Supplied in 1000 ft (304.8m) lengths. |
| **2037811** | Silicone Carbide Cloth. Used to polish steel and copper wire prior to winding into catalyst coils. 100 grit. |

| Catalog Number | Product Description |
|---|---|
| Thermometers | |
| **2036243** | Oxidation Cell Thermometer. For ASTM D943 and D4310. Range: 80 to 100°C. |
| **2036812** | ASTM 40C Thermometer. For constant temperature baths. Range: 72 to 126°C. |

## Oxidation Stability Apparatus, 30- & 60-Unit

### Test Method

Evaluates oxidation stability by subjecting the sample to a temperature of 95°C in the presence of oxygen or dry air. For inhibited mineral oils, the sample is reacted with oxygen in the presence of water and an iron-copper catalyst.

### Features and Benefits

- Conforming to ASTM and related test method specifications
- Convenient operation and servicing of thirty or sixty test cells
- Complete bath temperature, water level, air flow and condenser water systems

### Oxidation Stability Apparatus, 8- & 12-Unit

Constant temperature water baths for high volume oxidation stability applications. Provides temperature control, metered air flow and condenser water supply controls for as many as thirty or sixty cells in a single system, eliminating the need for multiple water and electrical feeds and oxygen supply tanks. Microprocessor PID control provides quick temperature stabilization without overshoot, and the bath is protected by a redundant overtemperature control circuit that interrupts power should bath temperature exceed a programmed cut-off point. Display provides actual setpoint temperature values in °C/°F format. Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. A 6 or 12kW heat exchanger with heavy duty magnetic drive circulation pump provides rapid and uniform heat transfer throughout the bath. Bath liquid depth is automatically maintained within ASTM specified tolerances by an electronic water level control system. Two banks of individually controlled flowmeters maintain the required oxygen flow rate to each test cell, and condenser water control valves for each cell are mounted on manifolds along the sides of the bath. A centrally mounted trough collects condenser waste water for convenient disposal or recirculation through an external cooling device. Bath interior is constructed of heavy gauge welded stainless steel. All components are easily accessible for servicing if required. Supplied with a sturdy finished angle-iron frame for floor standing installation. Order oxidation cell glassware and accessories separately.

**Specifications**

Conforms to the specifications of: ASTM D943, D2274, D2893*, D4310, D6158; ISO 4263, 12205; AOCS CD12-57*; DIN 51586, DIN 51587; NF M 07-047; NF T 60-150

*Modified versions of this equipment are available for ASTM D2893 "Oxidation Characteristics of Extreme Pressure Lubricating Oils" and AOCS CD12-57 "Fat Stability Active Oxygen Method." Information will be furnished upon request.

Temperature Control Stability: ±0.1°C (±0.2°F)

Oxygen Flow Rate: 3L/h to each test cell, individually controlled

Bath Capacity:

30-place model: 60 gal (227L)

60-place model: 114 gal (432L)

*Available option for 30- and 60-place Oxidation Baths–temperature/pressure recorder with built-in alarms for low pressure and over/under temperature. Please contact* EXPOTECH USA *for specifications and ordering information.*

**Electrical Requirements**

30-place model: 220-240V, 50/60Hz, Single Phase, 28A

60-place model: 220-240V, 50/60Hz, Single Phase, 54A

Other electrical configurations are available upon request.

**Dimensions** lxwxh,in.(cm)

30-place model: 43x55x52 (109x140x132)

60-place model: 43x78x52 (109x198x132)

**Shipping Information**
Shipping Weight:
30-place model: 892 lbs (404.6kg)
60-place model: 995 lbs (451.3kg)

Dimensions:
30-place model: 94 Cu.ft.
60-place model: 148 Cu.ft.

## Ordering Information

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2036005** | Oxidation Stability Apparatus, 30-Unit | 220-240V 60Hz |
| **2036466** | Oxidation Stability Apparatus, 30-Unit | 220-240V 50Hz |
| **2036466** | Oxidation Stability Apparatus, 60-Unit | 220-240V 60Hz |
| **2037209** | Oxidation Stability Apparatus, 60-Unit | 220-240V 50Hz |

## Accessories

| Catalog Number | Product Description |
|---|---|
| ASTM D943, D4310, and D2274 Accessories<br>For ASTM D2274, order one each 2024154 Oxygen Delivery Tube, 2024162 Oxidation Test Tube, and 2024163 Condenser for each cell. | |
| **2035570** | Oxidation Cell Assembly for ASTM D943 and D4310. Includes oxidation cell, condenser, oxygen delivery tube, thermometer bracket, oil level indicator strip, syringe sampling tube, sampling tube holder, spacer |
| **2024154** | Oxygen Delivery Tube |
| **2024162** | Oxidation Test Tube |
| **2024163** | Condenser |
| **2035478** | Thermometer Bracket |
| **2036702** | Oil Level Indicator Strip |
| **2035718** | Syringe Sampling Tube Holder |
| **2037070** | PTFE Stopper |
| **2037543** | Syringe Sampling Spacer |
| **2035321** | Syringe Sampling Tube |
| **2037766** | O-Rings |
| Iron-Copper Catalyst. For ASTM D943 and D4310. | |
| **2037065** | Catalyst Coil. Low-metalloid steel wire and electrolytic copper wire wound in a double spiral conforming to ASTM specifications. Packed in a sealed glass tube with a nitrogen atmosphere. Ready for use. |
| **2038173** | Wire Coiling Mandrel. Mounts on bench for winding steel and copper wire into catalyst coils meeting ASTM specifications. |
| **2035258** | Steel Wire. Low metalloid steel wire, 0.0625" (1.59mm) diameter, for catalyst coils. Supplied in 1000 ft (304.8m) lengths. |
| **2038079** | Copper Wire. Electrolytic copper wire, 0.064" (1.63mm) diameter, for catalyst coils. Supplied in 1000 ft (304.8m) lengths. |
| **2037811** | Silicone Carbide Paper. Used to polish steel and copper wire prior to winding into catalyst coils. 100 grit. |
| Thermometers | |
| **2036243** | Oxidation Cell Thermometer. For ASTM D943 and D4310. Range: 80 to 100°C. |
| **2036812** | ASTM 40C Thermometer. For constant temperature baths. Range: 72 to 126°C. |

# Oxidation Stability Apparatus, 12-Unit, Solid Block

## Test Method

Evaluates oxidation stability by subjecting the sample to a temperature of 95°C in the presence of oxygen or dry air. For inhibited mineral oils, the sample is reacted with oxygen in the presence of water and an iron-copper catalyst.

## Features and Benefits

- Conforming to ASTM and related test method specifications
- Accommodates twelve oxidation cells
- Microprocessor digital temperature control

## Oxidation Stability Apparatus, 12-Unit, Solid Block

Constant temperature aluminum block oxidation bath with flowmeters and condenser water manifold for twelve cells. Insulated solid block design provides efficient operation at temperatures of up to 450°F (232°C). Microprocessor temperature control unit features digital setpoint and display and built-in overtemperature protection. Includes individual flowmeters and control valves for each cell, delivering air flow at the rate of 3L/h. Condenser water manifold has individual control valves for each cell. Order oxidation cell glassware and accessories separately.

### Specifications

Conforms to the specifications of: ASTM D943, D2274, D2893*, D4310, D6158; AOCS CD12-57*; DIN 51586, 51587; ISO 4263, 12205; NF M 07-047; NF T 60-150

* Modified versions of this equipment are available for ASTM D2893 “Oxidation Characteristics of Extreme Pressure Oils” and AOCS CD12-57 “Fat Stability-Active Oxygen Method.” Information will be furnished upon request.

Testing Capacity: 12 oxidation cells

Maximum Temperature: 450°F

Temperature Control Stability: ±0.2°F (±1°C)

Air Flow Rate: 3L/h

### Electrical Requirements

220-240V 50/60Hz, Single Phase, 16A

### Dimensions lxwxh,in.(cm)

30x10x43 (76x25x109)

Net Weight: 345 lbs (156.5kg)

### Shipping Information

Shipping Weight: 440 lbs (199.6kg)

Dimensions: 12 Cu. ft.

### Ordering Information

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2037358** | Oxidation Stability Apparatus, 12-Unit, Solid Block | 220-240V 50/60Hz |

*Solid block baths meet temperature control and other requirements of ASTM and related methods. While the aluminum block design offers operating advantages over the standard oil bath, it should be noted that many applicable specifications for this test call for a liquid bath medium.*

| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| ASTM D943, D4310, and D2274 Accessories<br>For ASTM D2274, order one each 2024154 Oxygen Delivery Tube, 2024162 Oxidation Test Tube, and 2024163 Condenser for each cell. | |
| **2035570** | Oxidation Cell Assembly for ASTM D943 and D4310. Includes oxidation cell, condenser, oxygen delivery tube, thermometer bracket, oil level indicator strip, syringe sampling tube, sampling tube holder, spacer |
| **2024154** | Oxygen Delivery Tube |
| **2024162** | Oxidation Test Tube |
| **2024163** | Condenser |
| **2035478** | Thermometer Bracket |
| **2036702** | Oil Level Indicator Strip |
| **2035718** | Syringe Sampling Tube Holder |
| **2037070** | PTFE Stopper |
| **2037543** | Syringe Sampling Spacer |
| **2035321** | Syringe Sampling Tube |
| **2037766** | O-Rings |
| Iron-Copper Catalyst. For ASTM D943 and D4310. | |
| **2037065** | Catalyst Coil. Low-metalloid steel wire and electrolytic copper wire wound in a double spiral conforming to ASTM specifications. Packed in a sealed glass tube with a nitrogen atmosphere. Ready for use. |
| **2038173** | Wire Coiling Mandrel. Mounts on bench for winding steel and copper wire into catalyst coils meeting ASTM specifications. |
| **2035258** | Steel Wire. Low metalloid steel wire, 0.0625" (1.59mm) diameter, for catalyst coils. Supplied in 1000 ft (304.8m) lengths. |
| **2038079** | Copper Wire. Electrolytic copper wire, 0.064" (1.63mm) diameter, for catalyst coils. Supplied in 1000 ft (304.8m) lengths. |
| **2037811** | Silicone Carbide Paper. Used to polish steel and copper wire prior to winding into catalyst coils. 100 grit. |
| ***Thermometers*** | |
| **2036243** | Oxidation Cell Thermometer. For ASTM D943 and D4310. Range: 80 to 100°C. |
| **2036812** | ASTM 40C Thermometer. For constant temperature baths. Range: 72 to 126°C. |

## Oxidation Stability of Mineral Insulating Oils

### Test Method

Determines oxidation stability of mineral transformer oils by measuring the amount of sludge and acid formed under prescribed accelerated aging conditions.

### Features and Benefits

- Conforms to ASTM D2440 specifications
- Microprocessor temperature control with digital display and over temperature cut-off
- Six-sample testing capacity

### Oxidation Stability of Mineral Insulating Oils

Constant temperature oil bath for testing oxidation stability of mineral insulating oils. Immerses six oil receptacles at the required depth per ASTM specifications at 110°C ± 0.5°C, and controls oxygen flow to each sample at the rate of 1L/h ± 0.1L/h through six independent flow meters mounted on a common manifold. Insulated double-wall stainless steel bath has microprocessor temperature control with °C/°F switchable digital

setpoint and display. Operator and equipment are protected by an over-temperature control circuit which automatically interrupts power to the unit when bath temperature exceeds a programmed cut-off point. Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Contact your EXPOTECH USA representative for information. Order bath thermometer drying tower and catalyst separately.

**Specifications**

Conforms to the specifications of: ASTM D2440
Capacity: Six samples
Temperature Range: ambient to 260°F (127°C)
Circulator: 1/20hp impeller
Bath Capacity/Medium: 2.5 gal (9.5L) white technical oil

**Electrical Requirements**

115V 50/60Hz, Single Phase, 8.1A
220-240V 50/60Hz, Single Phase, 4.2A

**Included Accessories**

Oil Receptacle and Head (6)

**Dimensions** lxwxh,in.(cm)
14x15x22 (36x38x56)
Net Weight: 31 lbs (14.1kg)

**Shipping Information**

Shipping Weight: 61 lbs (27.7kg)
Dimensions: 14.4 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **1844053** | Oxidation Stability Apparatus | 115V 50/60Hz |
| **1844054** | Oxidation Stability Apparatus | 220-240V 50/60Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2035358** | Copper Catalyst Coils. Sealed in a glass jar with a nitrogen atmoshpere. Pack of 24 (12 sets). |
| **2036971** | Drying Tower, 250mL. With ground glass stopper and side tubes. |
| **2036733** | Glass Filter Crucible |
| **2035753** | ASTM 95C Thermometer. Range: 100 to 130°C |
| **1844054** | White Technical Oil. 1 gal container. |
| **1844054** | White Technical Oil. 5 gal container. |

# Corrosiveness & Oxidation Stability Apparatus

## Test Method

Evaluates the ability of a lubricant to resist oxidation and the formation of corrosive acid compounds by subjecting a sample to accelerated oxidation conditions in a catalytic environment. The sample is maintained at elevated temperature and subjected to a controlled air flow while in the presence of a series of test specimens made of metals commonly found in actual service conditions

## Features and Benefits

- Models for ASTM, Federal and IHC test methods
- Six-sample testing capability
- Solid aluminum block design
- Microprocessor temperature control with digital display and over temperature protection

### Specifications

Conforms to the specifications of: ASTM D4636, D5968; FTM 791-5307, FTM 791-5308; IHC BT-10; DIN 51394
Capacity: 6 test cells
Temperature Range:125 to 750°F (51.7 to 399°C)
Temperature Control Stability: ±1°F (±0.5°C)
Air Flow Rate:
ASTM D4636/FTM 791-5307: 10L/h
FTM 791-5308: 3L/h and 5L/h (dual range flow meters)
IHC BT-10: 3L/h (50mL/min.)

### Electrical Requirements

220-240V 50/60Hz, Single Phase, 15.9A

### Dimensions lxwxh,in.(cm)

32.5x14.5x4.5 (83x37x105)
Net Weight: 271 lbs (122.9kg)

### Shipping Information

Shipping Weight: 375 lbs (170.1kg)
Dimensions: 18.5 Cu. ft.

## Corrosiveness & Oxidation Stability Apparatus

Constant temperature block baths for corrosivity and oxidation stability determinations on hydraulic oils, aircraft turbine lubricants, transmission fluids and other highly refined oils. Insulated aluminum block provides safe, efficient performance at operating temperatures of up to 750°F (399°C). Microprocessor temperature control has °C/°F switchable digital setpoint and display. Operator and equipment are protected by an over-temperature control circuit which automatically interrupts power to the unit should block temperature exceed a programmed cut-off point.
*Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options.*
Contact your EXPOTECH USA representative for information. Air flow is controlled at the specified rate by six individually adjustable flow meters mounted on a common manifold. Includes inlet valve and outlet fitting for condenser water supply and support rack for glassware.

## Ordering Information

| Catalog Number | Product Description | Model | Electrical Requirements |
|---|---|---|---|
| **2035631** | Corrosiveness & Oxidation Stability Apparatus | ASTM D4636, D5968 and FTM 791-5307 Model | 220-240V 50/60Hz |
| **2037677** | Corrosiveness & Oxidation Stability Apparatus | FTM 791-5308 Model | 220-240V 50/60Hz |
| **2035548** | Corrosiveness & Oxidation Stability Apparatus | IHC BT-10 Model | 220-240V 50/60Hz |



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| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| Thermometers | |
| **2037009** | ASTM 8F Thermometer. Range: 30 to 760°F |
| **1394587** | ASTM 8C Thermometer. Range: –2 to +400°C |
| ASTM D4636, D5968, D6594 and FTM 791-5307 | |
| **2035929** | Sample Tube |
| **2037230** | Sample Tube Head |
| **2037888** | Air Tube |
| **2037845** | Thermocouple Tube |
| **2038034** | Condenser, Allihn Type |
| **2052423** | Spacer |
| **2036954** | PTFE Adapter |
| **2052424** | Oil Sampling Tube (for D5968 and FTM 791-5307) |
| **1794580** | Specimen Hanger (for D6594) |
| **2035344** | Thermocouple, Type J |
| **2035591** | Digital Thermometer. Microprocessor based digital thermocouple thermometer with ten-channel input. Monitors Type J thermocouples from sample tubes |
| **2036692** | Test Panel Assembly Fixture. Holds square-shaped metal specimens for tying with cord (for FTM 791-5307 and FTM 791-5308) |
| **2037703** | Condenser, Allihn Type |
| FTM 791-5308 | |
| **2036092** | Test Tube |
| **2035253** | Air Tube |
| **2037040** | Condenser |
| **2036692** | Test Panel Assembly Fixture. Holds square-shaped metal specimens for tying with cord. |
| IHC BT-10 | |
| **2038203** | Test Cell |
| **2038202** | Condenser |
| **2037086** | Air Tube |
| **2035675** | Ring Rod |
| Washer Shaped Specimens for ASTM D4636 Standard Procedure and for FTM 791-5307 | |
| **2035967** | Bronze |
| **2036775** | Mild Steel |
| **2036589** | Aluminum Alloy |
| **2035923** | Magnesium |
| **2036265** | Steel M50 |
| **2036843** | Silver |
| **2035809** | Titanium |
| Square Shaped Specimens for ASTM D4636 Alternate Procedure and for FTM 791-5308 | |
| **2035060** | Copper |
| **2035150** | Mild Carbon Steel |

| Catalog Number | Product Description |
|---|---|
| **2035734** | Aluminum Alloy |
| **2038122** | Magnesium Alloy |
| **2038120** | Cadmium Plated Steel |
| **2037584** | Silver |
| **2035994** | Solid Cadmium (non standard) |
| **2036270** | Titanium (non standard) |
| Square Shaped Specimens for ASTM D5968 and D6594 | |
| **2035060** | Copper |
| **2037117** | Lead |
| **2037215** | Tin |
| **2035590** | Phosphor Bronze |
| Rectangular Shaped Specimens for IHC BT-10 | |
| **2035060** | Copper |
| **2037117** | Lead |
| **2037215** | Tin |
| **2035590** | Phosphor Bronze |
| Polishing Materials | |
| **2036069** | Silicone Carbide Paper, 150-grit. Pack of 50 sheets. |
| **1790863** | Silicone Carbide Paper, 240-grit. Pack of 50 sheets. |
| **1790864** | Silicone Carbide Grain, 150-grit. 1 lb package. |

## Cigre Bath, Oxidation Stability Apparatus

### Test Method

Oxidation stability is determined by exposing the sample to a measured oxygen flow at elevated temperature in the presence of metal catalysts.

### Features and Benefits

- Conforms to IP specifications
- Twelve-sample testing capability
- Microprocessor programmable high accuracy temperature control

### Cigre Bath, Oxidation Stability Apparatus

Constant temperature aluminum block type bath for oxidation stability tests in accordance with the Institute of Petroleum (IP) testing methods. Accommodates twelve sets of oxidation and absorption tubes. Insulated block bath operates efficiently at temperatures of up to 200°C (392°F). Microprocessor PID control provides quick temperature stabilization without overshoot, and the bath is protected by a an over-temperature control circuit that interrupts power should block temperature exceed a programmed cut-off point. Dual LED displays provide actual and setpoint temperature values in °C/°F format. Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Contact your EXPOTECH USA representative for information. A bank of twelve flow meters on a movable stand regulates oxygen flow at 1 ± 0.1L/h to each oil sample per IP specifications. Includes soap bubble flow meter for checking oxygen flow rate.

**Specifications**

Conforms to: IP 48, IP 280, IP 306, IP 307, IP 335
Testing Capacity: Twelve samples
Temperature Range: 80 to 200°C
Temperature Uniformity: ±0.2°C
Air Flow Control:
Standard Model: 1L/h to each sample
IP 48 Model: 15L/h to each sample

**Electrical Requirements**
115V 50/60Hz, Single Phase, 12.1A
220-240V 50/60Hz, Single Phase, 6.3A

**Included Accessories**
Soap Bubble Flowmeter

**Dimensions**
Bath: dia.xh,in.(cm)
17x22 (43.2x55.9)
Flowmeter Stand: lxwxh,in.(cm)
24x8x30.25 (61x20.3x76.8)
Net Weight: 186 lbs (84.4kg)

**Shipping Information**
Shipping Weight: 245 lbs (111.1kg)
Dimensions: 16.7 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2037120** | Cigre Bath, Solid Block Bath | 115V 50/60Hz |
| **2035385** | Cigre Bath, Liquid Bath | 115V 50/60Hz |
| **2036835** | Cigre Bath, Solid Block Bath | 220-240V 50/60Hz |
| **2035385** | Cigre Bath, Liquid Bath | 220-240V 50/60Hz |
| **2036495** | Cigre Bath, Solid Block Bath for IP 48 Method | 115V 50/60Hz |
| **2036995** | Cigre Bath, Liquid Bath for IP 48 Method | 115V 50/60Hz |
| **2036059** | Cigre Bath, Solid Block Bath for IP 48 Method | 220-240V 50/60Hz |
| **2035576** | Cigre Bath, Liquid Bath for IP 48 Method | 220-240V 50/60Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2035064** | Set of Glassware. Includes one each oxidation and absorption tube. For IP 48, IP 280, IP 306, IP 307, IP 335. |
| **2035385** | ASTM 9C Thermometer. Range: -5 to +110°C. Equivalent to IP 15C Thermometer. |
| **2036835** | ASTM 41C Thermometer. Range: 98 to 152°C. Equivalent to IP 81C Thermometer. |

## L-60-1 Performance Test Apparatus

### Test Method

The L-60-1 Performance Test determines the deterioration of gear lubricants under severe thermal oxidation conditions. The sample lubricant is tested for 50 hours in a standardized gear box operating under a predetermined load. An elevated temperature and controlled air flow are maintained throughout the test and a copper catalyst is employed to accelerate the breakdown. At the end of the test period, various lubricant properties are determined by standard testing methods, and the weight loss of the catalyst is measured. The deposits that are formed on the gear box surfaces and the catalyst are examined and reported.

## Features and Benefits

- Conforms to ASTM D5704 and STP512A L-60-1 Performance Test specifications

## L-60-1 Performance Test Apparatus

Performs the L-60-1 Thermal Oxidation Stability performance test for API GL-5 gear lubricant service. Consists of a standardized gear box assembly with motor drive system and digital indicating controls for all test functions.

## Gear Case and Drive System

Two spur gears and a test bearing are operated inside a machined stainless steel case with removable window. The drive gear shaft is coupled to a heavy duty ball bearing motor loaded by a 45 ampere alternator. The standard L-60-1 test gear loading value of 128 watts generator output is precisely maintained by a digitally indicated load bank. All gear box components are easily accessible for cleaning.

## Temperature Control

An insulated heating case with high volume blower encloses the gear box. Sample oil temperature is maintained at 325 ± 1°F (162.8 ± 0.6°C) by a digital indicating controller with PT-RTD sensor. A built-in microprocessor based recorder produces a test oil temperature chart for reporting purposes. Over-temperature protection is provided by a separate PT-RTD-sensed controller.

## Air Flow Control

A high accuracy mass flow controller with digital indication maintains air flow to the gear box at a constant 1.1L/h. The self correcting controller maintains the setpoint flow rate regardless of fluctuations in air input pressure or temperature. Test cabinet and control cabinet are finished in chemical resistant polyurethane enamel. Test cabinet has a cover for access to the gear box and a removable drive motor cover.

### Specifications

Conforms to the specifications of: ASTM D5704; STP512A L-60-1 Performance Test (formerly CRC L-60 Test); FTM 791-2504
Dimensions: 16.7 Cu. ft.

Controls and Monitors
Sample Oil Temperature: °C/°F, digital setpoint and display, user adjustable
Over-temperature Limit Control: °F, user acceptable
Heating Chamber Air Temperature:°C/°F
Air Flow: L/h, digital setpoint and display, user adjustable
Test Gear Load: Volts DC, Amps. DC, digital display, user adjustable
Sample Oil Temperature Recorder: Programmable microprocessor based strip chart recorder with digital display, °C/°F
Drive Motor: 1725rpm thermally protected ball bearing type
Alternator: 45 ampere output

### Electrical Requirements

220-240V 60Hz, Single Phase, 15A
220-240V 50Hz, Single Phase, 15A

### Dimensions lxwxh,in.(cm)

Test Cabinet: 24x24x14.5 (61x61x37)
Control Cabinet: 23.5x23.5x17.5 (60x60x44)
Net Weight: 330 lbs (149.7kg)

### Shipping Information

Shipping Weight: 498 lbs (225.9kg)
Dimensions: 29.2 Cu. ft.

### Ordering Information

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2035593** | L-60-1 Performance Test Apparatus | 220-240V 60Hz |
| **2036531** | L-60-1 Performance Test Apparatus | 220-240V 60Hz |

### Accessories

| Catalog Number | Product Description |
|---|---|
| **1795871** | Test Kit. For one test and includes GA34 test gear, GA50 test gear, R-14 test bearing, viton shaft seals (2), O-ring seal, copper test strips (2). |
| **2036069** | Silicone Carbide Paper, 150-grit. (pack of 50) |



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# Rust Preventing Characteristics Oil Bath

## Test Method

Determines a lubricant's ability to prevent rusting of metal surfaces. Suitable for steam turbine oils, gear oils, hydraulic oils and other types of inhibited mineral oils. A steel test specimen is immersed in a heated mixture of sample oil and water which is stirred continuously during the test. After the test period the specimen is examined for rusting. The standard (ASTM D665) method uses a vertical specimen; the 'horizontal disc method' (ASTM D3603) uses both horizontal and vertical test surfaces.

## Features and Benefits

- Conforms to ASTM D665, D3603 and NACE TM-01-72* specifications
- Accommodates six sample beakers
- Microprocessor programmable high accuracy temperature control

## Rust Preventing Characteristics Oil Bath

Constant temperature bath with stirrers for rust preventing characteristics tests. Stirs sample-water mixtures at 1000rpm and controls temperature with ± 0.5°C (± 1°F) stability. Immerses test beakers at the proper depth per ASTM specifications.

Microprocessor PID control provides quick temperature stabilization without overshoot, and the bath is protected by an overtemperature control circuit that interrupts power should bath temperature exceed a programmed cut-off point. Dual LED displays provide actual and setpoint temperature values in °C/°F format. Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Contact your EXPOTECH USA representative for information.

Stainless steel stirrer paddles are driven by a ball bearing type motor through an improved pulley drive-roller bearing arrangement. Paddles can be raised and lowered for placement of sample beakers in the bath. Includes test specimens, holders and beaker covers for ASTM D665 or D3603 testing (see specifications and ordering information). Stainless steel bath includes perforated support shelf for beakers and two-position cover plate that adjusts for either ASTM D665 or D3603 testing. Long-lasting polyester drive belt improves reliability. Drive train components are protected by a removable steel guard. All exterior surfaces have stainless steel or chemical resistant polyurethane enamel finishes.

### Specifications

Conforms to the specifications of: ASTM D665, D3603, D6158; NACE TM-01-72*; IP 135; ISO 7120; DIN 51355**, DIN 51585; FTM 791-4011, 791-5315**; NF T 60-151
*To order this equipment for the NACE TM-01-72 test, please see 1844112.
**Accessories for these test methods are available upon request.
Testing Capacity: Six (6) 400mL sample beakers
Maximum Temperature: 104°C (220°F)

Temperature Control Stability: ±0.5°C (±1°F)
Drive Motor: 1/12hp induction motor
Bath Medium: 11 gal (41.6L) white technical oil

### Included Accessories

ASTM D665 Models (1865166, 2037747, 2037605)
Steel Test Specimens (6)
Type 2 Plastic Specimen Holders (6)
Plastic Beaker Covers (6)

ASTM D3603 Models (2036599, 2035436, 2035429)
Horizontal Disc Test Assembly (6) consisting of:
plastic beaker cover
horizontal test specimen
vertical test specimen
fluorocarbon washer
plastic cap
stainless steel support rods and hardware

### Electrical Requirements

115V 60Hz, Single Phase, 13.0A
220-240V 50 or 60Hz, Single Phase, 6.8A

### Dimensions lxwxh,in.(cm)

32.75x14.25x27 (83x36x69)
Net Weight: 79 lbs (35.8kg)

### Shipping Information

Shipping Weight: 150 lbs (68kg)
Dimensions: 16.2 Cu. ft.



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## Ordering Information

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **For ASTM D665** | | |
| **1865166** | Rust Preventing Characteristics Oil Bath | 115V 60Hz |
| **2037747** | Rust Preventing Characteristics Oil Bath | 220-240V 50Hz |
| **2037605** | Rust Preventing Characteristics Oil Bath | 220-240V 60Hz |
| **For ASTM D3603** | | |
| **2036599** | Rust Preventing Characteristics Oil Bath | 115V 60Hz |
| **2035436** | Rust Preventing Characteristics Oil Bath | 220-240V 50Hz |
| **2035429** | Rust Preventing Characteristics Oil Bath | 220-240V 60Hz |

## Test Specimens

| Catalog Number | Product Description |
|---|---|
| **1186707** | Steel Test Specimen for ASTM D665 Machined to ASTM specifications. Without Holder. |
| **1395948** | Test Specimen with Type 2 Plastic Holder for ASTM D665 |
| **2035630** | Test Specimen with Type 1 Plastic Holder for ASTM D665 |
| **2037707** | Test Specimen with Type 2 PTFE Holder |
| **2037171** | Horizontal Test Specimen for ASTM D3603 |
| **2036549** | Vertical Test Specimen for ASTM D360. |
| **2038116** | Horizontal Disc Rust Test Assembly for ASTM D3603. Includes polycarbonate beaker cover, two stainless steel support rods, disc carrier and one each horizontal and vertical test specimens. |

## Accessories

| Catalog Number | Product Description |
|---|---|
| **2037149** | Test Beaker, 400mL. For ASTM D665 & D3603 |
| **1793619** | ASTM 9F Thermometer. Range: 20 to 230°F |
| **2036580** | ASTM 9C Thermometer. Range: –5 to +110°C |
| **2036879** | Chuck for polishing test specimens. Includes locknut and shaft for mounting on accessory drive motor. |
| **2037012** | Drive Motor. Drives 2036879 Chuck. Mounted on base. 115V 50/60Hz |
| **2042417** | Drive Motor. Similar to 2037012 but for operation on 220-240V 50Hz |
| **2036779** | Aluminum Oxide Cloth, 150-grit. For preliminary grinding of test specimens. Pack of 50. |
| **2037793** | Aluminum Oxide Cloth, 240-grit. For final polishing of test specimens. Pack of 50. |
| **2036806** | Auxiliary Stirrer Blade. Attaches to stirrer shaft for testing heavier than water samples - ASTM D665 Procedure C. |

## Lead Corrosion Test Apparatus

### Test Method

Measures the corrosiveness of lubricating oils to lead in the presence of a copper catalyst. Lead and copper test panels are rotated in the test lubricant under specified test conditions, and the degree of corrosion is determined by the change in weight of the lead panel.

### Features and Benefits

- Conforms to FTM 791-5321 specifications
- Six-sample capacity
- Microprocessor programmable high accuracy temperature control

## Lead Corrosion Test Apparatus

Constant temperature apparatus rotates copper and lead test panels in lubricant samples to determine corrosiveness to lead per FTM specifications. Panels are rotated at 600rpm in samples maintained at 163°C (325°F) and aerated at 0.94L/min (2.0 Cu. ft./hr).

Test panel shafts ride on ball bearing spindles driven by a 1/15hp motor. A counterbalanced support bar positions the drive shaft for testing or for mounting and removal of test panels. When the support bar is raised, a safety microswitch automatically stops the drive motor to prevent splashing of hot oil.

Fully insulated bath features double-wall stainless steel construction, with a built-in support rack to suspend test cells vertically at the proper depth. Microprocessor PID control provides quick temperature stabilization without overshoot, and the bath is protected by an over-temperature control circuit that interrupts power should bath temperature exceed a programmed cut-off point. Dual LED displays provide actual and setpoint temperature values in °C/°F format. Communications software (RS232,etc.), ramp-to-set and other enhanced features are available as extra cost options. Contact your EXPOTECH USA representative for information. A 1/20hp stirrer thoroughly circulates the bath medium for temperature uniformity. Redundant over-temperature protection is provided by a built-in backup thermostat. Flowmeters and valves mounted on a convenient manifold provide individual air flow control for each test cell.

### Specifications

Conforms to the specifications of: FTM 791-5321.1
Testing Capacity: 6 lubricant samples
Maximum Temperature: 199°C (390°F)
Temperature Control Stability: ±0.05°C (±0.1°F)
Air Flow Control: 0.94 ± 0.047L/min (2 ± 0.1 Cu. ft./hr) six (6) flowmeters mounted on a common manifold

### Electrical Requirements

220-240V 60Hz, Single Phase, 14.5A
220-240V 50Hz, Single Phase, 14.5A

### Included Accessories

Copper Test Panels (6)
Lead Test Panels (6)
Mounting Hardware for Panels

### Dimensions lxwxh,in.(cm)

39x25x47 (99x64x119)
Net Weight: 214 lbs (97kg)

### Shipping Information

Shipping Weight: 330 lbs (150kg)
Dimensions: 33.5 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2035702** | Lead Corrosion Test Apparatus | 220-240V 60Hz |
| **2037894** | Lead Corrosion Test Apparatus | 220-240V 50Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **1395947** | Pyrex™ Sample Tube |
| **2036992** | ASTM 16F Thermometer. Range: 85 to 392°F |
| **2036464** | ASTM 16C Thermometer. Range: 30 to 200°C |
| **2036108** | Lead Test Panels |
| **2037490** | Copper Test Panels |

# Copper Strip Tarnish Test Apparatus

## Test Method

The Copper Strip Tarnish Test assesses the relative degree of corrosivity of petroleum products, including lubricating oils. A polished copper strip is immersed in 30mL of sample at elevated temperature. After the test period, the strip is examined for evidence of corrosion and a classification number from 1-4 is assigned based on a comparison with the ASTM Copper Strip Corrosion Standards

## Features and Benefits

- Conforms to ASTM D130, D6074, D6158 and related specifications
- Accommodates 16 test tubes
- Temperature range to 190°C (374°F)
- Microprocessor temperature control with digital display and overtemperature protection.

## Copper Strip Tarnish Test Apparatus

Constant temperature bath immerses 16 test tubes for copper strip tarnish tests of products not requiring a test bomb. Microprocessor temperature control has °C/°F switchable digital setpoint and display. Operator and equipment are protected by an over temperature control circuit which automatically interrupts power to the unit should bath temperature exceed a programmed cut-off point. Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Welded stainless steel double-wall construction with built-in support rack. Fully insulated.

The complete apparatus for the Copper Strip Tarnish Test for lubricating oils consists of:
Test Tube Bath
Copper Strips
Test Tubes
ASTM Copper Strip Corrosion Test Standard
Surface Preparation Accessories

### Specifications

Conforms to the specifications of: ASTM D130, D6074, D6158; FSPT DT-28-65; IP 154; ISO 2160; DIN 51759; FTM 791-5325; NF M 07-015
Capacity: 16 test tubes
Maximum Temperature: 190°C (374°F)
Temperature Control Stability: ±1°C (±2°F)
Heater Range: 0-750W
Bath Medium: 5 gal (18.9L) water or high temperature heater transfer fluid

### Electrical Requirements

115V 50/60Hz, Single Phase, 7.5A
220-240V 50/60Hz, Single Phase, 4A

**Dimensions** lxwxh,in.(cm)
15.5x12.5x14 (39x32x36)
Net Weight: 27 lbs (12.2kg)

### Shipping Information

Shipping Weight: 45 lbs (20.4kg)
Dimensions: 12.8 Cu. ft.

### Accessories

| Catalog Number | Product Description |
|---|---|
| **1186691** | Copper Test Strips. 12.5 x 1.5-3.0 x 75mm to ASTM specifications |
| **1790861** | Test Tube, 25x150mm |
| **2023470** | Viewing Test Tube. Protects copper strip during inspection or storage |
| **1186692** | ASTM Copper Strip Corrosion Standard. Colored reproductions of tarnished strips encased in a plastic plaque. |
| **1790863** | Silicone Carbide Paper, 240-grit. For polishing copper strips prior to testing. Package of 50 sheets. |
| **2036069** | Silicone Carbide Paper, 150-grit |
| **1790864** | Silicone Carbide Grain, 150-grit. For final polishing of copper strips prior to testing. 1 lb package. |
| **2024686** | Polishing Vise. Holds copper strip firmly in place without marring the edges. Stainless steel. mounted on a composition base. |
| **1340233** | Multi-Strip Polishing Vise. Similar to K25000 but capable of holding four strips at a time. |
| **2037926** | ASTM 12F Thermometer. Range: –5 to +215°F |
| **1793023** | ASTM 12C Thermometer. Range: –20 to +102°C |



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| Ordering Information | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Electrical Requirements** |
| **1408115** | Copper Strip Corrosion Test Tube Bath | 115V 50/60Hz |
| **1844091** | Copper Strip Corrosion Test Tube Bath | 220-240V 50/60Hz |
| **1844090** | Vented Cork (16) | |

## Cloud Point & Pour Point Apparatus

### Test Method

Cloud point and pour point are indicators of the lowest temperature of utility for petroleum products. The sample is periodically examined while it is being cooled in the cloud and pour point apparatus. The highest temperature at which haziness is observed (cloud point), or the lowest temperature at which movement of the oil is observed (pour point), is reported as the test result.

### Features and Benefits

- Conforms to ASTM D97, D2500 and related specifications
- Compact four-place portable chamber
- Mechanically refrigerated models with factory preset cold baths

### Cloud Point & Pour Point Apparatus

**Cloud and Pour Point Chamber** – Immerses four copper test jackets in suitable freezing mixtures at the required depth per ASTM specifications. Available with inlet and outlet connections for circulating refrigerated coolant from an external source. Consists of steel exterior housing with polyurethane enamel finish and all copper interior for corrosion resistance. Removable composition top plate and 1/2" (13mm) cork insulation around interior aid in cold retention. Supplied with copper jackets, gaskets, disks, and thermometer holders for test jars and cooling bath. Order test jars and thermometers separately.

**Mechanically Refrigerated Baths** – Bench-model and floor-model test units with multiple four-jacket mechanically refrigerated baths, each factory preset at a different temperature for convenient cloud and pour point testing. Bench model has three baths, set at +30, 0, and –30°F (–1, –18 and –35°C); floor model has four baths, set at +30, 0, –30 and –60°F (–1, –18 –35 and –51°C). Each bath has a phenolic top plate with ports for thermometer and four copper test jackets. Synthetic sponge covers over each top plate and gasketed hoods over each bath prevent excessive ice accumulation around the test jackets. Cascade hermetic refrigeration system provides reliable long term service. Bath interior and cabinet are constructed entirely of stainless steel. Floor model rides on swivel castors. Supplied with test jackets, gaskets, disks, and thermometer holders for test jars and cooling baths.

**Specifications**

Conforms to the specifications of: ASTM D97, D2500, D5853, D6074, D6158; IP 15, 219; ISO 3015, 3016; DIN 51597; FTM 791-201; NF T 60-105

**Electrical Requirements**

Model 1392029 Refrigerated Bench Model:
115V 60Hz, Single Phase 12.2A
220-240V 50/60Hz, Single Phase, 6.9A

Model 1340120 Refrigerated Floor Model:
115V 60Hz, Single Phase, 17.7A
220-240V 50/60Hz, Single Phase, 9.7A

**Dimensions**

Model 1186717: dia.xh,in.(cm)
10.5x12 (27x30)
Net Weight: 14 lbs (6.3kg)

Model 1392029: lxwxh,in.(cm)
30x28x35 (76x71x89)
Net Weight: 340 lbs (155kg)

Model 1340120: lxwxh,in.(cm)
44x38x48 (112x97x122)
Net Weight: 392 lbs (178kg)

**Shipping Information**
Shipping Weight:
Model 1186717: 18 lbs (8.2kg)
Refrigerated Bench Model: 550 lbs (250kg)
Refrigerated Floor Model: 605 lbs (275kg)

Dimensions:
Model 1186717: 2.6 Cu. ft.
Refrigerated Bench Model: 14.1 Cu. ft.
Refrigerated Floor Model: 60.6 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | |
|---|---|---|
| **For ASTM D665** | | |
| **1392029** | Rust Preventing Characteristics Oil Bath | |
| **1844132** | Cloud and Pour Point Chamber, with inlet/outlet fittings | |
| **Refrigerated Models** | | |
| **1392029** | Cloud and Pour Point Bath, Bench Model | 115V 60Hz |
| **1402103** | Cloud and Pour Point Bath, Bench Model | 220-240V 50Hz |
| **1844133** | Cloud and Pour Point Bath, Bench Model | 220-240V 60Hz |
| **1340120** | Cloud and Pour Point Bath, Floor Model | 115V 60Hz |
| **1844134** | Cloud and Pour Point Bath, Floor Model | 220-240V 50Hz |
| **1844135** | Cloud and Pour Point Bath, Floor Model | 220-240V 60Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **1408115** | Test Jar. Clear, flat bottom jar with sample height graduation. |
| **1844091** | ASTM 5F Thermometer. Range: –36 to +120°F |
| **1844090** | ASTM 5C Thermometer. Range: –38 to +50°C |
| **1844091** | ASTM 6F Thermometer. Range: –112 to +70°F |
| **1844090** | ASTM 6C Thermometer. Range: –80 to +20°C |
| **1844091** | Cork Disk |
| **1844090** | Gasket, for test jar |
| **1844091** | Thermometer Holder, for test jar |
| **1844090** | Copper Jacket |

## Automated Cloud Point and Pour Point of Petroleum Products

### Test Method

Determines the temperature below which solid hydrocarbon crystals form in aviation fuels. The sample is cooled with continuous stirring in a Dewar-type sample tube until crystals appear.

### Features and Benefits

- Conforms to ASTM D97, D2500 and related specifications
- Direct cooling system eliminates the need for solvent cooling baths
- One-stage cooling system provides temperatures as low as –35°C and a two-stage cooling system down to –80°C
- Single start/stop push button makes system simple to use
- Minimal installation required to set-up software and instrumentation

### Automatic Freezing Point System

Cloud Point Detection–The cloud point detection system provides automated sample testing with the accuracy and repeatability in accordance with ASTM D2500 and related international test methods. The sophisticated dynamic measurement system emits a light pulse every 1°C from a coaxial fiber optic cable positioned above the test sample. The light pulse is then reflected off the silvered-bottom test jar to an optical sensor.

The advanced software package analyzes the response of the light pulse. The initial appearance of crystallization is monitored by light scattering, signifying the cloud point of the sample. All clear and transparent oils are readily measured by the detection system, regardless of sample color.

**Pour Point Detection** – The pour point detection system provides automated testing with the accuracy and repeatability in accordance with ASTM D97 and related international test methods. The automated operation includes the removing of the sample from the cooling jacket at 3°C intervals and tilting it to a 90° angle as prescribed by the test method until no flow is observed. Contact of the cold sample with the two Pt-100 temperature probes position just above the surface liquid level when the test jar is tilted identifies sample flow. The test jar is automatically returned to the cooling jacket and sampled again until no flow is detected for 5 seconds. The pour point result is then reported at 3°C higher than the temperature at which the sample ceased to flow in accordance with the test method.

**Advanced Software Package** – The Windows®-based software package can control either a stand-alone system or provides multiple analyzer networking with a single network control station. All analytical parameters are graphed and displayed in real-time as well as recorded in Microsoft® Excel file format. The software monitors the operation and performance of all the analyzer components for proper data measurement, including the solenoid valves, cooling system, other moving parts, as well as the Pt-100 temperature probes and the pressure sensors. The calibration curves for each probes and sensors are displayed individually and saved to the hard disk with date and time of test.

**Cooling System** – For various user applications, the automated freezing point system is available with either one-stage cooling for temperatures as low as –35°C or two-stage cooling for temperatures as low as –80°C. The direct cooling system requires no solvent cooling bath and thus eliminates operator exposure to solvents used in standard cooling systems. The direct system is capable of rapid cooling, approaching –80°C bath temperatures in approximately 15 minutes, and utilizes less electricity than in standard cooling systems. The rapid cooling feature combined with a consistent cooling profile system provides repeatable results with high test reproducibility.

**Multiple Configuration System** – These automated sample cooling and physical property measurement systems can be configured with up to six test positions with one of five possible test heads at each position: cloud point, pour point, cloud & pour point, freezing point, and cold filter plugging point. Standard and customized multiple configuration systems are readily available. Please inquire with EXPOTECH USA customer service about product specifications and ordering information.

**PC Configuration** – Operation of the software package requires the use of a PC, which should be ordered separately. The PC should have the following minimum requirements: Pentium III 800 MHz processor, 128 MB RAM, 2 GB hard drive, CD-ROM, Windows® operating system, Microsoft® Excel, Windows® keyboard, monitor, mouse, graphic and video cards.

**Specifications**

Conforms to the specifications of:
2283715: ASTM D2500; IP 219;
ISO 3015, ISO 3016; DIN 51597
2281609: ASTM D97; IP 15; ISO 3016
2273418: ASTM D97, D2500,
D5853; IP 15, IP 219;
ISO 3015, ISO 3016; DIN 51597

**Electrical Requirements:**
115V 60Hz, Single Phase
220V 50Hz, Single Phase

**Dimensions** lxwxh,in.(cm)

28x23x28 (71.2x59x71.2)
Net Weight: 205 lbs (93kg)

**Included Accessories**

Internal built-in direct refrigeration system
One- or two-stage cooling system
Interface Cells and Cables
Operating Software
Acquisition Board
Cord Cable without plug
Test Jars



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| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2283715** | Automatic Cloud Point System (one-head unit) |
| **2281609** | Automatic Pour Point System (one-head unit) |
| **2273418** | Automatic Cloud/Pour Point System (one-head unit) |
| **2052735** | Automatic Cloud Point System (one-head) Two-stage (to ñ80ƒC) |
| Please specify voltage and cooling requirements when ordering. | |

*Please specify voltage and cooling requirements when ordering. You may order a multiple configuration system (any combination of freezing point, cloud and cloud/pour point, and cold filter plugging point) with up to six heads. Please specify each measurement head with its associated catalog number using the sequential number combination.*

## Panel Coking Test Apparatus

### Test Method

Determines the tendency of finished oils to form coke when in contact with surfaces at elevated temperatures for short periods. A sample of oil is mechanically splashed against an aluminum test panel at elevated temperature. After a specified test period, the amount of coke deposited on the panel is determined by weight.

### Features and Benefits

- Conforms to FTM 791-3462 specifications
- Suitable as a screening test prior to performing engine tests

### Panel Coking Test Apparatus

Digitally controlled panel coking apparatus for finished lubricating oils, consisting of mechanical splasher, splash chamber and sample oil reservoir Test panel temperature and oil sump temperature are individually controlled by separate heaters with digital-indicating controllers. Mechanical splasher has a variable speed 0-1800rpm drive motor with digital indicating control. A high accuracy variable area flow meter permits introduction of a corrosive acidic atmosphere to increase the severity of the test. Equipped with a digital countdown timer (a cyclic timer is available upon request). Hinged safety cover has a port for fume removal and a safety interlock switch that interrupts power to the drive motor when the cover is lifted.

**Specifications**

Conforms to the specifications of: FTM 791-3462
Maximum Temperature:
Test Panel: 400°C (752°F)
Sample Oil: 210°C (410°F)
Temperature Control: Separate controls for test panel and oil temperature, with digital °C/°F digital setpoint and display

Splashing Rate: 0-1800rpm, with digital display
Timer: 0-99.9 hr variable countdown
Flow meter Range: 0.2-1.0L/hr
Oil Reservoir Capacity: 0.35 liter

**Electrical Requirements**

115V 50/60Hz, 8A
220-240V 50/60Hz, 5A

**Dimensions** lxwxh,in.(cm)
Test Unit: 32x18x21 (81x46x53)
Control Cabinet: 18x12x18 (46x30x46)
Net Weight:
Test Unit: 50 lbs (22.7kg)
Control Cabinet: 25 lbs (11.3kg)

**Shipping Information**

Shipping Weight: 135 lbs (61.2kg)
Dimensions: 26.7 Cu. ft.

| Ordering Information | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Electrical Requirements** |
| **2037262** | Panel Coking Test Apparatus | 115V 50/60Hz |
| **2303503** | Panel Coking Test Apparatus, with cyclic timer | 115V 50/60Hz |
| **2303485** | Panel Coking Test Apparatus, with cyclic timer | 220-240V 50/60Hz |
| **2036083** | Panel Coking Test Apparatus | 220-240V 50/60Hz |

| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2035115** | Aluminum Test Panel |
| **2037244** | Stainless Steel Test Panel (Type 321) |

## Noack Evaporation Loss Apparatus & Data Acquisition Software

### Test Method

A quantity of 65g of a lubricant is placed in an evaporative crucible and heated to 250°C for 60 minutes. The evaporation loss tendencies of the lubricant are determined by passing a constant air stream over the heated sample by means of a vacuum pump.

### Features and Benefits

- Conforms to ASTM D5800, DIN 51581 specifications
- Non-woods Metal or Woods Metal heating bath

## Noack Evaporation Loss Apparatus

### Noack Evaporation Loss Apparatus

The Noack Evaporation Loss Analyzer tests the evaporation loss tendencies of lubricating oils at temperatures of up to 350°C, available with either a Non-Woods Metal or a Woods Metal heating bath.

### Non-Woods Metal Option

Fully insulated aluminum block heating unit has a microprocessor-based digital temperature and pressure controller. A digital stopwatch is also included for recording test and cooling times. The test is started automatically after insertion of the crucible and displays both temperature and pressure curves in real-time throughout the test. The stainless steel evaporation crucible inserts into the aluminum block oven and includes a plated brass lid assembly with threaded support ring, hardened steel air nozzles, and extraction tube with threaded and sealed connection. Order required accessories separately.

### Woods Metal Option

Fully insulated aluminum block heating unit has a microprocessor-based digital temperature controller and stopwatch for recording test and cooling times. The evaporation crucible is identical as listed above. Aluminum block accepts certified thermometers for temperature monitoring. Order required accessories, vacuum pump, and automated pressure control unit separately.

**Specifications**

Conforms to the specifications of: ASTM D5800; DIN 51581
Capacity: 1 sample
Temperature Range: 150 to 350°C
Temperature Accuracy: ±0.1°C

**Electrical Requirements**

115V 60Hz, 12.0A
230V 50Hz, 5.8A

**Dimensions** lxwxh,in.(cm)

Non-Woods Metal Noack Tester with Stand and Glassware Set:
23.25x14.5x26.75 (59x36.8x68)
Net Weight: 59 lbs (26.7kg)
Woods Metal Noack Tester: 18x14.5x14.5 (45.7x36.8x36.8)
Glassware Set and Vacuum Regulator: 23.25x14.5x26.75 (59x36.8x68)
Net Weight: 84.25 lbs (38.2kg)

**Required Accessories**

Glassware Set, consisting of (2) bottles with ground stoppers, glass tubes, and tubing set



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Vacuum Pump
Evaporation Crucible
Crucible Wrench and Clamp
Reamer, 2mm diameter
5 Test Balls, 3.5mm diameter
Protection Gloves
300g Woods Metal and Brush
Stand with Inclined Manometer (range: 0-30mm H2O) and Bleed Valve for Manual Regulation of Air Stream

### Shipping Information

Shipping Weight:
Non-Woods Metal Unit: 124 lbs (56kg)
Woods Metal Unit: 62.5 lbs (28.4kg)
Dimensions:
Non-Woods Metal Unit: 5.0 Cu. ft.
Woods Metal Unit: 7.3 Cu. ft.

## Noack Software

Noack Software automatically retrieves in real-time complete test parameters including temperature, pressure, and elapsed test time, providing hands-free data acquisition. The software defaults to monitor temperature at 250 ± 0.5°C and pressure at 20±0.2mm H2O; however, these parameters are easily changed for other user specifications. The software will indicate whether the temperature or pressure values exceed the user-defined limits during the test. The sophisticated Windows®-based software package features an easy-to-navigate operation, a straightforward user interface, minimal draw on Windows® memory resources, automatic real-time data acquisition via RS232 connection, and a timer / stopwatch feature for general laboratory use. Direct communication eliminates weighing errors by recording values directly from the balance with a simple click of the mouse. The "test intelligent" software simplifies the testing process by providing sequential test prompts for assisting the operator with each step of the test procedure.
The active zoom, pan, and trace feature allows the ability to change axes and the magnification of any sector of the pressure or temperature graphs to view data in greater detail. The final test data is exported with graphs and test parameters either directly to Microsoft® Excel, in ASCII file format for use with LIMS or any other spreadsheet programs, or directly to a printer with a test report according to ISO guidelines. Test data is saved in a database format for determining test averages, standard deviations, and ASTM test repeatability. The software package requires no PC hardware installation and includes the software installation CD and computer connection cables.

### Computer Requirements

PC Processor: Intel® Pentium II or similar (minimum)
Processor Speed: 500 MHz or higher
Operating System: Windows® 98 SE, 2000, NT, ME, XP
Memory (RAM): 64 Mb RAM (128 Mb RAM recommended)
Hard Disk Space: 15 Mb free space (minimum)
Communication Ports: one or two RS232 ports
Other Software: Microsoft® Excel (97 or above)

### Ordering Information

| Catalog Number | Product Description | Order Qty |
|---|---|---|
| *Accessories for Non-Woods and Woods Metal Units* | | |
| **2251715** | Standardization Oil | 1 |
| **2251743** | Glassware Set | 1 |
| **2346847** | Evaporation Crucible | 1 |
| Accessories for Non-Woods and Woods Metal Units | | |
| **2251716** | Crucible Spanner and Clamp | 1 |
| **2251717** | Reamer, 2mm diameter | 1 |
| **2251718** | Test Balls (5), 3.5mm diameter | 1 |
| Additional Accessories (for Woods Metal Unit Only) | | |
| **2251714** | Vacuum Pump, 230V 50/60Hz | 1 |



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| Ordering Information | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Electrical Requirements** |
| **2346844** | Noack Evaporation Loss Apparatus | 115V 60Hz |
| **2251612** | Noack Evaporation Loss Apparatus | 230V 50/60Hz |
| **2251612** | Non-Woods Metal Noack Evaporation Loss Apparatus | 230V 50/60Hz |
| **2251713** | Noack Data Acquisition Software | |

## Apparent Viscosity of Engine Oils

### Test Method

Determines the measurement of the Yield Stress, Apparent Viscosity and Borderline Pumping Temperature (BPT) of engine oils. Borderline pumping temperature is a measure of the lowest temperature at which an engine oil can be continuously and adequately supplied to the oil pump inlet of an automotive engine. Provides a correlation between the temperature at which the viscosity of engine oils reaches a critical value and the borderline pumping failure temperature in engines at the test method specified shear stress.

### Mini-Rotary Viscometer

- Testing capacity of up to 10 samples.
- Microprocessor temperature controllers store all testing profiles in memory.
- Unique design is fully self-contained - no external refrigeration or heating apparatus needed.
- Advanced direct refrigeration technology eliminates the need for liquid cooling mediums such as methanol.
- Removable test cells allow for easy cleaning, sample agitation and advance sample preparation.
- New rotor design eliminates possible interference with water and ice.
- Internal hermetic refrigeration system provides direct instant cooling.
- Power-saver feature allows testing profile to resume in the event of a brief power interruption.
- Internal gas system provides a continuous blanket of dry gas over samples to eliminate moisture buildup
- Rotor stator rack supplied for convenient cleaning, drying, and storage.
- Safety features include high pressure cutout and high temperature limits.
- Rotor stator sets included with instrument. Additional sets readily available.
- Optional Software Package available

**Specifications**

Conforms to the specifications of:
ASTM D4684; SAE J300; ILSAC GF3-GF4
In accordance with the specifications of:
ASTM D3829, D6821*, D6896
* With available Drive Line equipment sold separately
Cabinet Material: Stainless steel and durable thermoplastic
Temperature Range: +80°C to -40°C (176°F to -40°F)
Bath Design: Solid, direct cooling without liquids

Cooling Rate: Single Unit: 5.0°C per minute maximum
Refrigerant: R-507
Compressor Size: 1/3 Horsepower
Electrical Requirements:
115V 50/60Hz, 15A
220V 50/60Hz, 7A
Temperature Control: +/- 0.1°C, digital readout
Heating Capacity: 600 Watts
Testing Capacity: 10 samples

**Included Accessories**

Removable Rotor/Stator Sets (10)
Rotor/Stator Holding Rack
Stator Removal Tool
Moisture Cover
Set of Weights & Strings
Air Filter Dryer and Desiccant

**Dimensions** lxwxh,in.(cm)
15.5x12.5x13.5 (39x32x34)
Net Weight: 105 lbs (47.6 kg)

**Shipping Information**

Shipping Weight: 143 lbs (64.86 kg)
Dimensions: 23 x 19 x 27 in (58.4 x 48.3 x 68.6 cm)



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| Ordering Information | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2283892** | Mini-Rotary Viscometer, 220V 50/60Hz |

| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2346775** | Stator Insertion/Removal Tool (SIRT) |
| **2346776** | Moisture Cover |
| **2346777** | Rotor/Stator Set (1 Set) |
| **2346778** | Rotor/Stator Set (Set of 10) |
| **2346779** | Stainless Steel Thumb Nut |
| **2346780** | Air Filter Dryer with Desicant |
| **2346781** | Rotor/Stator Holding Rack |
| **2346782** | MRV Weight Set – Standard |
| **2346783** | N105B Reference Oil (Pint) |
| **2346784** | MRV String Set (Qty 10) |
| **2346785** | MRV Driveline Rotor (for D6821) |
| **2346786** | MRV Weight Set – Driveline (for D6821) |
| **2346787** | Desiccant Media – 1 lb. |

# TRIBOLOGY WEAR & FRICTION TESTING EQUIPMENT


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# High-Frequency Reciprocating Rig (HFRR)

## Test Method

A 2-mL test specimen of fuel is placed in the test reservoir and maintained at 25 or 60°C. When the temperature has stabilized, a vibrator arm holding a non-rotating steel ball and loaded with a 200-g mass is lowered until it contacts a test disk completely submerged in the fuel. The ball is caused to rub against the disk with a 1-mm stroke at a frequency of 50 Hz for 75 min. The ball is removed from the vibrator arm and cleaned. The dimensions of the major and minor axes of the wear scar are measured under magnification and recorded.

## Features and Benefits

- ASTM D6079; ISO 12156
- Capable of engaging a steel ball loaded against a stationary plate with an applied load and oscillating at a fixed frequency and stroke length while the contact interface is fully immersed in a fluid reservoir.

## High-Frequency Reciprocating Rig (HFRR)

The two-station Fuel Lubricity Wear Test Machine incorporates two test positions with heater pads and mounting arrangements for fuel lubricity test specimens. Load is applied manually by means of dead weights directly to the fixed ball specimen carrier by means of a loading yoke. Machine controls are limited to speed control of the drive motor to give the required frequency, temperature control of the specimen bath and test duration. Test data is limited to post test wear scar measurement only and no facilities are provided for friction force measurement.

The electro-mechanical drive is used to achieve a wide range of frequencies, and the 1 mm stroke is generated with a cam. This ensures that the amplitude remains constant as friction forces vary in the contact. The ball specimen is mounted in a holder connected to the horizontal oscillating shaft. The shaft is double ended and two tests can be run at the same time. The holder is hinged to ensure that the line of action of the oscillator remains in the horizontal plane of contact. This also means that loads can be applied directly to the contact without loading the oscillator shaft. A simple yoke locates on the oscillating shaft and load is applied by calibrated weights. The plate specimen is located in a bath that both seals and clamps the specimen. Beneath the bath is a block that is heated by an electrical resistance element and the temperature is controlled by a thermocouple closely located beside the specimen. Each heater block is mounted on a stiff fabricated support. A clear acrylic cover is provided to house the test heads. Operation of the machine is straightforward. The machine is equipped with two digital programmable controllers for temperature. Temperature setpoint can therefore be set independently for each station. In addition, there is a digital programmable frequency controller and test timer.

The controllers are pre-set when the machine leaves the factory to the operating conditions required of the test methods. Once enabled, the machine heats each of the baths to a set point of 60°C. Once this temperature is reached the motor is switched on automatically to run at 50Hz. The test timer is preset for the duration of 75 minutes, which commences once the motor starts. At the end of the test the machine automatically switches off.

### Specifications

Test specifications: ASTM D6079; ISO 12156
Contact Geometry: Ball on Plate
Ball Specimen: 6 or 10 mm diameter
Load: 1.95 to 10.00 N (± 0.01 N)
Stroke: 1 mm (± 0.02 mm)
Frequency: 2.5 to 50 Hz (± 1 Hz)
Fluid Volume: 2 mL (± 0.2 mL)
Test Temperature: Ambient to 100°C
Heating Power: 250W at each station
Temperature Sensor: K-type thermocouple
Test Duration: 75 min (± 0.1 min)
Bath Surface Area: 6 cm2

### Electrical Requirements

115V 50/60Hz, Single Phase
230V 50/60Hz, Single Phase



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| Ordering Information | |
|---|---|
| **Catalog Number** | **Product Description** |
| **1797415** | High Frequency Reciprocating Rig 220-240V 50/60Hz |
| **1797416** | Test Plates/Test Balls for ISO Fuel Lubricity Method N188 (100 pieces) |
| **1797417** | Microscope for Wear Scar Measurement with Filar Measuring Eyepiece, 4x/0.10 DIN Objective and Adjustable Spot Light |

| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2330784** | Humidity Cabinet, 115V 50/60Hz |
| **2330785** | ASTM Fluid A, 1/2 gal |
| **2330786** | ASTM Fluid B, 1/2 gal |
| **1508215** | Ball Carrier |
| **2330792** | Cartridge Heater, 240V |
| **1500748** | Knurled Screw |

## Four Ball Wear and EP Tester

### Features and Benefits

- Conforms to ASTM D2266, D2596, IP 239 and related specifications
- Performs Wear Preventative (WP) and Extreme Pressure (EP) tests
- Displays and records normal load, frictional torque, time and temperature
- Test speeds and temperature are electronically controlled
- Data Acquisition Software and Card are included
- Optional CCD Camera is available for wear scar imaging
- Custom configurations are available
- Precise variable loading capability

### Four Ball Wear and EP Tester

Four Ball Tester performs both Wear Preventative (WP) and Extreme Pressure (EP) analyses for measuring the wear and frictional properties of lubricants under sliding-on-steel test conditions. Tests are performed in accordance to the latest ASTM and IP published methods. Normal load on the ball assembly and frictional torque are measured through load cells. Wear scars on the steel balls are measured with a graduated-scale microscope and can be recorded with an optional CCD camera. Data is processed and stored utilizing TriboDATA, and advanced data acquisition and processing software package. Test results can be plotted and compared, as well as exported to other programs.

**Specifications**

Conforms to: ASTM D2266, D2596, D2783, D4172, D5183*; IP 239

**Electrical Requirements:**

220V, 60Hz, 3 phase
440V, 50Hz, 3 phase
Drive Motor Power: 1.5 kW
Test Speeds: 1200, 1440, 1760 rpm
Optional Test Speeds (min/max): 1000/3000, 300/3000 rpm
Maximum Axial Load: 10000 N at 3000 rpm or 12000 N at 1800 rpm
Test Duration (min/max): 1/9999 min
Test Ball diameter: 12.7mm

**Included Accessories**

Set of Weights
Ball Chucks
Ball Pot
Ball Chuck Remover
Ball Rack
Ball Clamp Ring
Ball Holder Base Disc
Set of Hand Tools
Torque Wrench
Graduated-Scale Microscope
Electronic Controller
Connecting Cables
TriboDATA Software
Calibration and Test Reports

**Shipping Information**

Shipping Weight: 1360 lbs (620 kg)
Dimensions: 45 Cu

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **1844175** | Four Ball Tester | 220V 60Hz |
| **1844176** | Four Ball Tester | 380V 50Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2288910** | Test Balls (Pack of 100) |

*IP300 and CEC-L-45-A-99 units available. Please contact* EXPOTECH USA *customer servive for additional information.*

## Pin-On-Disc Tester

### Features and Benefits

- Conforms to ASTM G99 standard test method
- Analyzes wear and friction characteristics of sliding contacts (dry or lubricated conditions)
- Tests can be performed on a variety of materials: metals, polymers, composites, ceramics, lubricants, cutting fluids, abrasive slurries, coatings, and heat-related samples
- TriboDATA software package varies and records pin pressure, pin temperature, sliding speed, and lubrication parameters
- Custom configurations available

### Pin on Disc Tester

The Pin-On-Disc machine is a versatile unit designed to evaluate the wear and friction characteristics on a variety of materials exposed to sliding contacts in dry or lubricated environments. The sliding friction test occurs between a stationary pin stylus and a rotating disk. Normal load, rotational speed, and wear track diameter can be varied. Electronic sensors monitor wear and the tangential force of friction as a function of load, speed, lubrication, or environmental condition. These parameters as well as the acoustic emissions at the contact are measured and displayed graphically utilizing the TriboDATA software package.

**Specifications**

Conforms to the specifications of: ASTM G99
Sliding Speed Range: 0.26-10 m/sec
Disc Rotation Speed: 100-2000 rpm
Maximum Normal Load: 200 N
Frictional Force: 0-200 N
Wear Measurement Range: 4 mm
Pin Size: 3-12 mm diagonal/diameter
Disc Size: 160 mm x 8 mm thick
Wear Track Diameter: 10-140 mml

**Shipping Information**

Shipping Weight: 440 lbs (200 kg)
Dimensions: 18 Cu. Ft.



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### Specifications for Pin-On-Disc with Environmental Chamber & Lubricant Recirculating System

Temperature: 60°C
Discharge Rate: 0-1 L/min
Viscosity Range: 90SAE Maximum
Capacity: 3L of Lubricant

### Included Accessories

Electronic Controller Unit
Connecting Cables
Spare Fuses
TriboDATA Software
Set of Weights
Set of Hand Tools
Set of Pins
Calibration and Test Reports

| Ordering Information | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Electrical Requirements** |
| **2346867** | Pin-On-Disc Machine | 230V 50 Hz |
| **Optional Configurations Available** | | |
| Environmental Chamber<br>Lubricant Recirculation System<br>Environmental Chamber and Lubricant Recirculation System | | |

*High temperature models (up to 700°C) are available. Please contact* EXPOTECH USA *customer service for additional information.*

## Emcor Grease Testing Machine

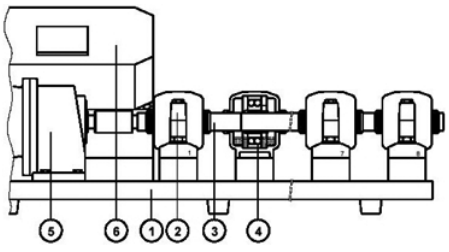
### Test Method

Measures the ability of a grease to protect a bearing against corrosion in the presence of water. Two sets of grease-coated bearings per station are partially immersed in water and rotated at a speed of 80 rpm in a sequence of running and resting periods. At the end of the test, the race-ways of the bearing outer rings are inspected for rust.

### Emcor Diagram

**Diagram Legend**

1 = Ground Plate
2 = Bearing Housings
3 = Shaft (nylon-coated)
4 = Test Bearing
5 = Electric Motor
6 = Electric Clock




### Features and Benefits

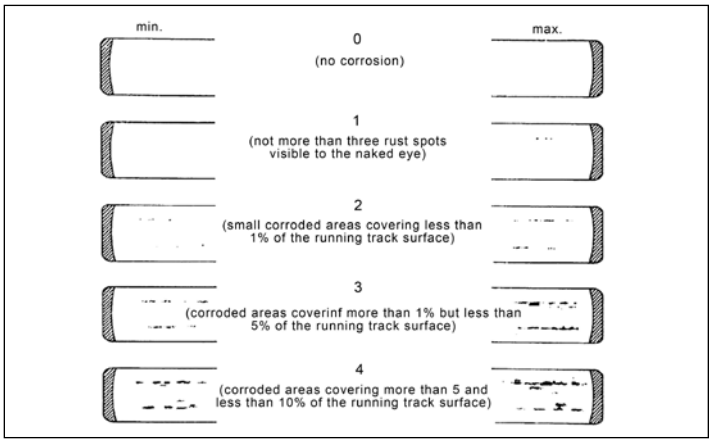
- Conforms to ASTM D6138, IP 220, DIN 51802, and related international test methods
- Evaluates the rust preventive properties of greases and oils
- Performs both standing and dynamic testing

## Emcor Tester

The Emcor Grease Testing Machine evaluates the rust preventive properties of greases on bearing components, measuring the ability of a grease to protect a bearing against corrosion in the presence of water. As bearings are normally used in environments exposed to humidity and temperature variations, condensation may form on the bearing thus promoting the onset of rust. Rust is detrimental to proper bearing operation and will compromise the longevity of the bearing. A good quality grease should be designed to protect the bearing from rust and corrosion under these conditions.

The Emcor test is performed by mounting a double-row bearing per test station for up to 8 separate test stations. The test bearings are specially-treated 1306K/236725 double row self-aligning ball bearings. The bearings are washed carefully, filled with the appropriate quantity of test grease and fitted on the shaft with the help of a nylon sleeve and nut. The seals are fitted and the specified quantity of water is introduced into the housings. The bearings are placed in the housings, and the housings are closed and sealed. The test is conducted with the bearings partially immersed in water and in a sequence of running and resting over a period of one week. This also determines whether the thin oil film left in the contact zone of rollers and raceways is able to protect the bearings against corrosion while the bearings are standing. At the end of the test, the raceways of the bearing outer rings are inspected for rust. The Emcor system features test method versatility, since both greases and oils can be tested as well as variations can be made with regard to the test medium (e.g., brine instead of water). The costs for running these tests are minimal. The two test bearings are the only machined parts that have to be renewed for each test, and the polyamide material for the housing is rigid and strong and rarely ever needs replacement.

## Emcor Chart


min.
max.
0
(no corrosion)
1
(not more than three rust spots visible to the naked eye)
2
(small corroded areas covering less than 1% of the running track surface)
3
(corroded areas coverinf more than 1% but less than 5% of the running track surface)
4
(corroded areas covering more than 5 and less than 10% of the running track surface)

### Specifications

Conforms to the specifications of:
ASTM D6138; IP 220; ISO 11007; DIN 51802; NFT 60-135; SIS 155130
Electrical Requirements:
115V, 60 Hz, 1 phase
230V, 50 Hz, 1 phase

**Dimensions** lxwxh, in.(cm)
48.5x15x11 (123x38x28)
Net Weight: 88 lbs. (40kg)

### Shipping Information

Shipping Weight: 121 lbs (55 kg)
Dimensions: 8 Cu. Ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements | Order Qty |
|---|---|---|---|
| **2287365** | Emcor Grease Testing Machine | 115V 60Hz | 1 |
| **2287365** | Emcor Grease Testing Machine | 230V 50Hz | 1 |

## Tribology Test Specimens and Other Tribology Equipment

### Slurry Abrasion Tester

Measures the slurry abrasive resistance of solid materials as prescribed by ASTM G105 specifications. Performs tests on metals, minerals, polymers, composites, ceramics, coatings, and heat-processed materials. A rectangular test sample is rotated in a slurry cup with the temperature maintained using a water bath. The test speed, temperature, duration, sample size, and slurry composition can be varied. The differential mass of the sample before and after the test is converted to volume loss (abrasion index) for direct comparison of the tested materials.

### Tapping Torque Tester

Evaluates metal working fluids and various machining operations according to ASTM D5619 for the the torque requirements of tapping operations in pre-drilled samples. Software package acquires cutting torque and rotational speed and displays them as a function of test duration or angle of tool rotation.

### Air Jet Erosion Tester

Performs air jet erosion test according to ASTM G76 specifications. A test sample is bombarded by a gas containing particulates with a known velocity and concentration of particles. Comparison can be made by varying

test sample composition, size, particle velocity, angle of incidence, and temperature.

## Dry Abrasion Tester

Measures index of abrasive resistance to dry sand according to ASTM G65 test specifications. Test specimen is held against a rotating wheel and abraded with a grit of controlled size, composition, and flow with the proper test duration and applied force as prescribed by the ASTM test method. The differential mass of the specimen before and after the test is recorded and converted to volume loss (abrasion index) for direct comparison of tested materials.

## Custom-Built Tribology Test Equipment and Test Specimens

Test specimens are available for all of the tribology instrumentation Please inquire with customer service about other custom-built tribology test equipment and test specimens. Custom-designed equipment is readily available for the following tribology test methods:

**Universal Wear (ASTM G77, G99)**
**Vane Pump Wear (ASTM D2882)**
**Shear Stability (ASTM D6278)**
**Slurry Erosion Tester**
**Reichert Tester**
**Grease Life Tester (D3336)**
**Grease Noise Tester**
**V2F Grease Testing Machine**
**ROF Grease Testing Machine (DIN 51806)**
**R2F Grease Testing Machine**

## LUBRICATING GREASES TESTING EQUIPMENT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# Evaporation Loss Test Apparatus

## Test Method

Evaluates the potential for evaporation loss of lubricant components in high temperature service. A controlled flow of heated air is passed over the sample for a specified period. Evaporation loss is measured by the change in sample weight during the test. The Evaporation Loss test can also be used for Estimating Apparent Vapor Pressures and Molecular Weights of Lubricating Oils (ASTM D2878). A high temperature version of the Evaporation Loss test is available (See ASTM D2595).

## Features and Benefits

- Conforms to ASTM D972, D2878 and related specifications
- Two-sample testing capability

## Evaporation Loss Test Apparatus

**Evaporation Cell** — Suitable for evaporation loss tests on lubricating greases and oils in the temperature range of 210 to 300°F (99 to 149°C). Passes heated air over the sample at the required flow rate. Consists of stainless steel body, cover, eduction tube and hood. Calibrated flow meter with needle valve maintains 2L/min. air flow at standard temperature and pressure. Supplied with stainless steel grease or oil sample cup. Sample cups are interchangeable. Entire assembly mounts in Evaporation Loss Test Bath.

**Evaporation Loss Test Bath** — Constant temperature oil bath mounts two Evaporation Cells in an upright position at the proper immersion level. Maintains test temperature within ±1°F (±0.5°C). Microprocessor PID control provides quick temperature stabilization without overshoot and the bath is protected by an over temperature control circuit that interrupts power should bath temperature exceed a programmed cut-off point. Dual LED displays provide actual and setpoint temperature values in °C/°F format. Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Contact your EXPOTECH USA representative for information. Fully insulated, double-wall construction, with stainless steel tank and polyurethane-finished steel exterior.

### Specifications

Conforms to: ASTM D972, D2878; IP 183; FTM 791-351
Capacity: 2 oil or grease samples
Maximum Temperature: 350°F (177°C)

Temperature Control Stability: ±1°F (± 0.5°C)
Circulation: 1/20hp stainless steel impeller
Bath Medium: 5.3 gal (20L) high temperature transfer fluid

### Included Accessories

Evaporation Cell:
Grease Sample Cup (2038097) or Oil Sample Cup (2037544)
Test Bath:
Support Clamps (2)
Thermometer Holder

### Electrical Requirements

115V 50/60Hz, Single Phase, 8.6A
220-240V 50/60Hz, Single Phase, 4.5A

### Dimensions

33" (maximum width with two evaporation cells inserted) x 25.5"h (84x65cm)
Net Weight: 62 lbs (28.1kg)

### Shipping Information

Shipping Weight: 90 lbs (40.8kg)
Dimensions: 14.2 Cu. ft.

## Ordering Information

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **Evaporation Test Cell** | | |
| **2038097** | Evaporation Test Cell with Grease Cup | |
| **2037544** | Evaporation Test Cell with Oil Cup | |



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| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **Evaporation Loss Test Bath** | | |
| **2036571** | Evaporation Loss Test Bath | 115V 50/60Hz |
| **2037896** | Evaporation Loss Test Bath | 220-240V 50/60Hz |

| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **1394492** | ASTM 22F Thermometer. Range: 204 to 218°F |
| **1394491** | ASTM 22C Thermometer. Range: 95 to 103°C |
| **2036999** | ASTM 67F Thermometer. Range: 203 to 311°F |
| **2036444** | ASTM 67C Thermometer. Range: 95 to 155°C |
| **2036602** | Temperature Limit Control, 115V 50/60Hz. Provides over temperature protection for constant temperature baths. |
| **2037394** | Temperature Limit Control, 220-240V 50/60Hz |
| **2035402** | Oil Sample Cup with Hood |
| **2037175** | Grease Sample Cup with Hood |

## High Temperature Evaporation Loss Test Apparatus

### Test Method

Evaluates the potential for evaporation loss of lubricant components in high temperature service. A controlled flow of heated air is passed over the sample for a specified period. Evaporation loss is measured by the change in sample weight during the test. The Evaporation Loss test can also be used for Estimating Apparent Vapor Pressures and Molecular Weights of Lubricating Oils (ASTM D2878). Similar to the ASTM D972 Evaporation Loss test, the temperature range is extended for evaporation loss testing to 600°F (316°C).

### Features and Benefits

- Conforms to ASTM D2595 specifications
- Microprocessor temperature control with digital display and overtemperature cut-off
- Microprocessor programmable high accuracy temperature control

### High Temperature Evaporation Loss Test Apparatus

Performs evaporation loss tests on lubricating greases at temperatures of up to 600°F (316°C). Maintains sample temperature within ±0.3°F while passing heated air over the sample surface at a controlled flow rate. Consists of evaporation cells and aluminum block oven with controls for sample temperature, air temperature and air flow rate. Evaporation cells include grease sample cup, head, eduction tube, cover and thermocouple tube. Aluminum block oven provides efficient response and safe operation

at high temperatures. Microprocessor temperature control has °C/°F switchable digital setpoint and display. Operator and equipment are protected by an overtemperature control circuit which automatically interrupts power to the unit when bath temperature exceeds a programmed cut-off point. Microprocessor PID control provides quick temperature stabilization without overshoot and the bath is protected by an overtemperature

control circuit that interrupts power should bath temperature exceed a programmed cut-off point. Dual LED displays provide actual and setpoint temperature values in °C/°F format. Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Separate air preheater controls and flowmeters for each cell permit accurate control of heated air flow to sample surface. Order accessory Digital Thermometer to monitor exit air temperature and ASTM 3F or 3C Thermometer for block (sample) temperature. Accessory oil sample cup converts evaporation cell for lubricating oil samples.

**Specifications**
Conforms to: ASTM D2595, D2878*
*with accessory oil sample cup installed
Capacity: 2 samples
Temperature Range: 200 to 600°F (93 to 316°C)
Sample Temperature Control:
Type: microprocessor digital control
Exit Air Temperature Control: Two 0-500W variable control heaters and type IC thermocouples. (Order 2035591 Digital Thermometer separately.)
Air Flow Control: Two externally mounted flowmeters maintaining 2L/min flow at standard temperature and pressure.

**Electrical Requirements**
220-240V 50/60Hz, Single Phase, 10.4A

**Included Accessories**
Evaporation Cell Assemblies with grease sample cups (2)
Type IC Thermocouples (2)

**Dimensions** lxwxh,in.(cm)
25x16x17 (64x41x43)
Net Weight: 175 lbs (79.4kg)

**Shipping Information:**
Shipping Weight: 224 lbs (101.6kg)
Dimensions: 10.4 Cu. ft

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2037421** | High Temperature Evaporation Loss Test Apparatus | 220-240V 50/60Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2035591** | Digital Thermometer, 115V 50/60Hz. Microprocessor based digital thermocouple thermometer with ten channel input. Monitors Type IC Thermocouples from evaporation cells in 2037421 Evaporation Loss Tester. Use together with preheater controls in Model 2037421 to maintain air temperature within ±1.1°C (±2°F) per ASTM specifications |
| **2035078** | Digital Thermometer, 220-240V 50/60Hz |
| **2037303** | ASTM 3F Thermometer. Range: 20 to 760°F |
| **2036325** | ASTM 3C Thermometer. Range: -5 to +400°C |
| **2035402** | Oil Sample Cup with Hood |
| **2037175** | Grease Sample Cup with Hood |

## Dropping Point Apparatus

### Test Method
Dropping point determinations are used for identification and quality control purposes, and can be an indication of the highest temperature of utility for some applications. The sample is heated at a prescribed rate in a precision machined cup whose sides slope toward an opening at its center. The temperature at which a liquid drop first falls from the cup is the dropping point of the sample.

### Features and Benefits
- Conforms to ASTM D566, D4950; NF T 60-102 and related specifications

### Dropping Point Apparatus
Performs dropping point determinations on lubricating greases at temperatures of up to 550°F (288°C). Consists of dropping point cup, test cell with accessories and oil bath with stirrer and heater. Test cell is immersed



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in a 400mL Pyrex™ bath for heating at the prescribed rate. A 750W variable stepless control heater and 1/40hp stirrer permit accurate, uniform control of bath temperature rate of rise. Heater assembly includes refractory top plate and reference dial.

**Specifications**
Conforms to the specifications of: ASTM D566, D4950; IP 132; ISO 2176; DIN 51801; FTM 791-1421; NF T 60-102
Maximum Temperature: 550°F (288°C)
Bath Medium: A high temperature heat transfer fluid having a flash point in excess of 400°C is recommended. Silicone fluid (P/N 355-001-002) is suitable.

**Electrical Requirements**
115V 50/60Hz, Single Phase, 6.5A
220-240V 50/60Hz. Single Phase, 3.4A

**Included Accessories**
Grease Cup, chromium plated brass
Test Tube with indentations
Cork Ring Guide
Thermometer Corks (2)
Thermometer Depth Gauge
Polished Metal Rod
Connecting Hardware

**Dimensions** lxwxh,in.(cm)
5x5x31(13x13x78)
Net Weight: 11 lbs (5.0kg)

**Shipping Information**
Shipping Weight: 16 lbs (7.3kg)
Dimensions: 2.8 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2037251** | Dropping Point Apparatus | 115V 50/60Hz |
| **2035252** | Dropping Point Apparatus | 220-240V 50/60Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2037199** | ASTM 2F Thermometer. Range: 20 to 580°F |
| **2037132** | ASTM 2C Thermometer. Range: -5 to +300°C |
| **2035580** | Cup Plug Gauge. Checks conformity of test cup with specifications. Per Fig. 1, ASTM D566 and Fig. 1-E7, ASTM D2265 |
| **2037517** | Polished Metal Rod |
| **2035708** | Grease Cup |
| **2035668** | Test Tube with indentations |
| **2036830** | Thermometer Cork |
| **2038099** | Cork Ring Guide |

# High Temperature Dropping Point Apparatus

## Test Method

The ASTM D2265 dropping point test permits higher temperatures than the ASTM D566 method and uses a different heating procedure: the test cell is inserted in an aluminum block oven maintained at a constant temperature that is higher than the expected dropping point of the sample. The sample temperature then rises to the dropping point without operator control.

## Features and Benefits

- Conforms to ASTM D2265 and D4950 specifications
- Six-sample testing capability
- Microprocessor programmable high accuracy temperature control

## High Temperature Dropping Point Apparatus

Tests dropping points of lubricating greases at temperatures of up to 400°C (752°F). Includes thermostatically controlled aluminum block oven and six complete dropping point assemblies. Six-place oven has large viewing ports with fluorescent backlighting for excellent visibility. Microprocessor PID control provides quick temperature stabilization without overshoot and the bath is protected by an overtemperature control circuit that interrupts power should block temperature exceed a programmed cut-off point. Dual LED displays provide actual and setpoint temperature values in °C/°F format. Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Microprocessor temperature control with digital readout and overtemperature safety cut-off maintains block temperature with ±0.5°C stability. Insulated cabinet has a chemical resistant polyurethane finish.

### Specifications

Conforms to: ASTM D2265, ASTM D4950

Maximum Temperature: 400°C (752°F)

Control Stability: ±0.5°C (±1°F)

### Electrical Requirements

115V 50/60Hz, Single Phase, 6.5A

220-240V 50/60Hz, Single Phase, 3.4A

### Included Accessories

Dropping Point Assemblies (6) consisting of: test tube, grease cup, thermometer clamp, upper and lower bushings and bushing support ring

Thermometer Depth Gauge

Polished Metal Rod

Cup Support

### Dimensions lxwxh,in.(cm)

11.5x9x14 (29x23x36)

Net Weight: 24.5 lbs (11.1kg)

### Shipping Information

Shipping Weight: 31 lbs (14.1kg)

Dimensions: 2.6 Cu. ft.

## Ordering Information

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2036863** | High Temperature Dropping Point Apparatus | 115V 50/60Hz |
| **2036049** | High Temperature Dropping Point Apparatus | 220-240V 50/60Hz |



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| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2037303** | ASTM 3F Thermometer. Range: 20 to 760°F |
| **2036325** | ASTM 3C Thermometer. Range: -5 to +400°C |
| **2035580** | Cup Plug Gauge. Per Fig. 1, ASTM D566 and Fig. 1-E-7, ASTM D2265 |
| **2035708** | Grease Cup |
| **2023450** | Test Tube, 13x100mm |
| **2038200** | Cup Support |
| **2036658** | Thermometer Clamp |
| **2035453** | Upper Bushing |
| **2036597** | Lower Bushing |
| **2037032** | Bushing Support Ring |
| **2035061** | Thermometer Depth Gauge |
| **2037517** | Polished Metal Rod |

## Oxidation Stability of Greases Test Apparatus

### Test Method

The sample is oxidized in a bomb initially charged with oxygen at 110psi (758kPa) and maintained at elevated temperature for a specified aging period. The pressure drop inside the bomb is measured by means of a gauge or transducer.

### Features and Benefits

- Conforms to ASTM D942 and related specifications
- Four sample testing capability
- Oxidata™ Pressure Measurement System is available with this system

### Oxidation Stability of Greases Test Apparatus

Consists of Oxidation Bombs, Sample Dishes, Pressure Measuring and Recording Equipment and Oxidation Bath

**Oxidation Bomb** – Stainless steel bomb consists of body, lid with stem and needle valve, and dish holder per ASTM specifications. Bomb interior surfaces and inside of stem have a high polish to facilitate cleaning. Safely withstands a working pressure of 180psi (1241kPa) at 99°C (210°F). Includes PTFE gasket seals (3) and cap screws with wrench. PTFE-fluorocarbon seals are available (see Accessories).

### Pressure Measurement and Recording Equipment

– Select mechanical pressure gauges or, for greater convenience and accuracy in test reporting, the Oxidata™ Pressure Management System designed expressly for ASTM oxidation tests Pressure gauge measures

pressure inside Oxidation Bomb with accuracy of better than 0.5psi (3.45kPa) in accordance with ASTM specifications. Range: 0-160psi (0-1100kPa), graduated in 1psi intervals. Cleaned for oxygen service.

**Oxidata™ Pressure Measurement System** – A complete electronic measurement system based on powerful Oxidata™ software for Windows® 98 SE, 2000, NT, ME, and XP environments. Electronically

measures and reports pressure versus time and accuracy of better than 0.5 psi (3.45kPa) in the range of 0-200psi (0-1378kPa) for four channels in graphical tabular format. Included RTD attachment permits measurement and reporting of bath temperature. Includes transducers, data acquisition box, Oxidata™ software CD, RTD probe assembly and connecting cables and hardware.

**Oxidation Bath** – Constant temperature oil bath holds bombs at the proper depth for determining oxidation stability of lubricating greases. Microprocessor PID control provides quick temperature stabilization without overshoot and the unit is protected by an overtemperature control circuit that interrupts power should bath temperature exceed a programmed cut-off point. Dual LED displays provide actual and setpoint temperature values in °C/°F format. Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Contact your EXPOTECH USA representative for information. Heavily insulated welded stainless steel bath interior has a bomb support rack and overflow standpipe/drain to maintain proper working depth. Steel exterior has a corrosion-resistant polyurethane enamel finish.

**Specifications**

Conforms to the specifications of: ASTM D942; IP 142; DIN 51808; FTM 791-3453

Oxidation Bath:

Capacity: four (4) oxidation bombs

Temperature Range: ambient to 275°F (135°C)

Bath Medium: 12.5 gal (47.3L) white technical oil

**Electrical Requirements**

115V 50/60Hz, Single Phase, 13.0A

220-240V 50/60, Single Phase, 6.8A

**Dimensions** dia.xh,in.(cm)

Interior: 16x14 (41x36)

Overall: 19.5x28.5 (50x72)

**Shipping Information** (with electronic pressure measurement system)

Shipping Weight:

Bath: 75 lbs (34.0kg)

Electronic Pressure Measurement System: 48 lbs (21.8kg)

Dimensions:

Bath: 16.7 Cu. ft.

Electronic Pressure Measurement System: 7.8 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **Oxidation Bath** | | |
| **2037279** | Oxidation Bath | 115V 50/60Hz |
| **2036819** | Oxidation Bath | 220-240V 50/60Hz |
| **Oxidation Bath** | | |
| **1865157** | Oxidation Bomb | |
| **Pressure Measurement and Recording Equipment** Select either Pressure Gauges or Oxidata™ Pressure Measurement System* | | |
| **2037096** | Pressure Gauge | |

| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2036204** | Pyrex™ Dish |
| **1394492** | ASTM 22F Thermometer. Range: 204 to 218°F |
| **1394491** | 22C ASTM 22C Thermometer. Range: 95 to 103°C |
| **1795640** | White Technical Bath Oil, 1 Gallon Container |
| **2042823** | White Technical Bath Oil, 5 Gallon Container |
| **1795075** | Transducer Assembly |
| **2024304** | Pressure Line. For pressurizing Oxidation Bomb. 6 ft (1.83m) long, with quick release coupling for needle valve on bomb and threaded fitting for oxygen tank. |
| **2024306** | Oxygen Manifold Pressure Relief System. Connects to oxygen source to prevent overcharging of bomb. Equipped with relief valve to vent at 125psi and 300 series stainless steel 150psi burst disk assembly. Constructed from 300 series stainless steel. Cleaned for oxygen service. |
| **2036489** | PTFE-fluorocarbon Gasket |

## Oxidata™ Data Acquisition Software Package

### Test Method

The sample is oxidized in a bomb initially charged with oxygen at 110psi (758kPa) and maintained at elevated temperature for a specified aging period. The pressure drop inside the bomb is measured by means of a gauge or transducer.

### Features and Benefits

- Electronic pressure measurement systems exclusively designed for D942 and other ASTM oxidation test methods
- Powerful software system for PC platforms operating in Windows® 98 SE, 2000, NT, ME, and XP environments
- Monitors up to twelve pressure channels and four temperature channels
- Displays average bath temperature and pressure readings in real-time
- Readily installed on most manufacturer's test apparatus

## Oxidata™ Data Acquisition Software Package

Oxidata™ is an advanced data acquisition system used to measure test data in real-time for fuel and lubricant ASTM oxidation tests. The system features pressure measurement transducers coupled with a sophisticated Windows®-based software package for acquiring pressure and temperature versus time data to a high degree of accuracy and precision. Oxidata™ monitors up to twelve samples simultaneously with a graphical display of the test results. An active zoom, pan, and trace option provides the ability to view the test results with closer scrutiny both during and after the data acquisition process. For ultimate user flexibility, each pressure channel can be independently configured for any of the applicable ASTM standard test methods or a user-defined test method without compromising either the independent start/stop capability or the accuracy of the other channels.

Oxidata™ software features an easy-to-navigate operation and a straightforward user interface. The "test intelligent" software simplifies the testing process by providing sequential test prompts for assisting the operator with each step of the test procedure. It also includes an additional timer/stopwatch available for any purpose. For each test, the user name,

sample name and identification, and test type are recorded. The test data is acquired in user specified time intervals, plotted on screen in real-time, and can be automatically saved to the hard drive during the test to prevent any loss of valuable data. The software features multiple display options which include the ability to view the status of all twelve pressure channels simultaneously, to display the complete graph of any one channel, or to simultaneously view four channels in graphical format. In addition to data acquisition, the PID temperature controller located on the oxidation bath can be fully controlled through the software, including setting the bath temperature, temperature calibration, °C/°F toggle, and recording the temperature data versus time in graphical format. The active zoom, pan, and trace feature allows the ability to change axes and the magnification of any plot sector on any pressure or temperature channel to view data in greater detail. The final test data is exported with graphs and test parameters either directly to Microsoft® Excel, in ASCII file format for use with LIMS or any other spreadsheet programs, or directly to a printer with a test report according to ISO guidelines. Test data is saved in a database format and can be analyzed again at any future time. This feature also provides reprocessing of data acquired with previous versions of the Oxidata™ software package, and it's easy to upgrade from the previous versions.

Each Oxidata™ package requires no PC hardware installation and includes transducers, bomb couplings, RTD probe assembly, data acquisition box with USB port connector, software, and mounting and connecting hardware. Additional channels can be added for up to a total of twelve pressure channels and four temperature channels.

**Included Accessories**

Pressure transducers (connects directly to pressure vessel)
Data acquisition box with USB port connector
Oxidata™ software CD
RTD probe assembly
Connecting cables and hardware

## Oxidata™ Features and Specifications

- On-screen, real-time monitoring of up to twelve samples simultaneously
- Test results directly plotted on-screen for instant monitoring or print out of results
- Menu options for fuel, oil, and grease ASTM oxidation tests including D525, D942, D2112 and D2272 (RPVOT – formerly RBOT), and D4742 (TFOUT)
- Programmable automatic end-point detection with graphical representation for customizing test methods
- Each channel can be independently configured and operated with different start/stop times and ASTM test methods
- Zoom, pan, and trace feature allows for magnification of any plot area on any channel for a more detailed study
- Monitors and reports temperatures of as many as four baths simultaneously using accessory RTD probes, and calculates and displays average temperature for each bath
- Exports test data with graphs and test parameters directly to Microsoft® Excel or in ASCII file format for use with LIMS or any other spreadsheet programs
- Temperature and pressure calibration utility included in software package
- Data can be routinely saved directly to the hard drive during testing to prevent loss of valuable data
- Operates in Windows® 98 SE, 2000, NT, ME, and XP environments

**Computer Requirements**

PC Processor: Intel® Pentium II or similar (minimum)
Processor Speed: 500 MHz or higher
Operating System: Windows® 98 SE, 2000, NT, ME, XP
Memory (RAM): 64 Mb RAM (128 Mb RAM recommended)
Hard Disk Space: 15 Mb free space (minimum)
Communication Ports: one USB port
Other Software: Microsoft® Excel (97 or above)

**Ordering Information**

| Catalog Number | Model | Product Description | Electrical Requirements |
|---|---|---|---|
| **2037161** | 4-Unit System | Oxidata™ Pressure Measurement System Windows® XP version for Lubricating Grease Oxidation Tests | 115V 60Hz |
| **2037280** | 4-Unit System | Oxidata™ Pressure Measurement System Windows® XP version for Lubricating Grease Oxidation Tests | 220-240V 50/60Hz |
| To upgrade existing Windows® 95/98-based Oxidata™ systems to Version 7.2 for Windows® XP, order a USB upgrade kit. The kit includes a USB port communication box, Oxidata™ software CD, and computer cables. Does not include pressure tranducers with the upgrade kit. | | | |
| **2036098** | 4-Unit System | Oxidata™ Pressure Measurement System Upgrade from Windows® 95/98 to XP for Lubricating Grease Oxidation Tests | 115V 60Hz |
| **2037846** | 4-Unit System | Oxidata™ Pressure Measurement System Upgrade from Windows® 95/98 to XP for Lubricating Grease Oxidation Tests | 115V 60Hz |

| Ordering Information | | | |
|---|---|---|---|
| **Catalog Number** | **Model** | **Product Description** | **Electrical Requirements** |
| To upgrade existing Windows® DOS-based Oxidata™ systems to Version 7.2 for Windows® XP, order a retrofit kit. The kit includes a data acquisition box with USB port connector, Oxidata™ software CD, and computer cables. Does not include pressure tranducers with the retrofit kit. | | | |
| **2035372** | 4-Unit System | Oxidata™ Pressure Measurement System Retrofit from Windows® DOS to XP for Lubricating Grease Oxidation Tests | 115V 60Hz |
| **2036015** | 4-Unit System | Oxidata™ Pressure Measurement System Retrofit from Windows® DOS to XP for Lubricating Grease Oxidation Tests | 220-240V 50/60Hz |

| Ordering Information | |
|---|---|
| **Catalog Number** | **Product Description** |
| **1795075** | Pressure Transducer |

## Corrosion Preventive Properties Apparatus

### Test Method

Determines the corrosion preventive properties of greases when distributed in a tapered roller bearing stored under wet conditions.

### Features and Benefits

• Conforms to ASTM D1743, D4950 and D5969 specifications

### Corrosion Preventive Properties Apparatus

Distributes a lubricating grease sample in a roller bearing by running the bearing under light thrust load. Corrosion preventive capability is determined on a pass/fail basis by the presence of rust spots (1mm or larger) on the bearing race after a 60 second run-in period followed by prolonged exposure to water at constant temperature. Consists of variable speed motor, 1750rpm run-in stand, bearing holder assemblies, spindle/thrust loading device, mechanical grease packer pliers and test bearings.

**Specifications**

Conforms to the specifications of: ASTM D1743, D4950, D5969
Draft Method
Drive Motor: 1750rpm

**Electrical Requirements**

115V 50/60Hz, Single Phase, 2.0A
220-240V 50/60Hz. Single Phase, 1.0A

**Included Accessories**

Spindle/Thrust Loading Device
Mechanical Grease Packer
Pliers
Test Bearings (3) (cone and roller assemblies)
Bearing Holder Assemblies (3), consisting of:
1kg weight
upper and lower plastic collars for cone
plastic collar for cup
plastic jar with screw cap
metal screw

**Dimensions** lxwxh,in.(cm)
10x15x20 (25.4x38.1x50.8)
Net Weight: 27 lbs (12.2kg)

**Shipping Information**

Shipping Weight: 36 lbs (16.3kg)
Dimensions: 5 Cu. ft.



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| Ordering Information | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Electrical Requirements** |
| **2037035** | Corrosion Preventive Properties Apparatus | 115V 50/60Hz |
| **2037316** | Corrosion Preventive Properties Apparatus | 220-240V 50/60Hz |

| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2038220** | Bearing Holder Assembly |
| **2037949** | Upper Flange |
| **2035237** | Lower Flange |
| **2036135** | Mechanical Grease Packer |
| **2035451** | Pliers |
| **2036600** | Plastic Jar |
| **2038011** | Test Bearing |

## Corrosion Preventive Properties Apparatus, Alternate Method

### Test Method

Determines the corrosion preventive properties of greases when distributed in a tapered roller bearing stored under wet conditions.

### Features and Benefits

• Conforms to ASTM D1743-73 specifications

### Corrosion Preventive Properties Apparatus, Alternate Method

Determines corrosion preventive properties of lubricating greases in accordance with original ASTM D1743-73 specifications, now incorporated as Appendix #2 in the current ASTM D1743 method. Offers a suitable alternative to the new method for laboratories needing a quicker screening test method. Consists of drive motor on base with driving cone hub, thrust loading device, mechanical grease packer, test bearings (3), bearing supports (3) and containers with lids (3).

**Specifications**

Conforms to the specifications of: ASTM D1743-73, FTM 791-4012

**Electrical Requirements**

115V 50/60Hz, Single Phase, 5.2A
220-240V 50/60Hz, Single Phase, 2.6A

**Dimensions** lxwxh,in.(cm)
7x12x9.75 (18x30x25)
Net Weight: 27 lbs (12.3kg)

**Shipping Information**

Shipping Weight: 36 lbs (16.3kg)
Dimensions: 5 Cu. ft.

| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2035636** | Thrust Loading Device and Mechanical Grease Packer |
| **2037673** | Test Bearing |
| **2037202** | Bearing Supports |
| **2037493** | Container with Lid |

| Ordering Information | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Electrical Requirements** |
| **2037053** | Corrosion Preventive Properties Apparatus, Alternative Method | 115V 50/60Hz |
| **2035488** | Corrosion Preventive Properties Apparatus, Alternative Method | 220-240V 50/60Hz |

# Copper Strip Tarnish Test Apparatus

## Test Method

Measures the tendency of lubricating grease to corrode copper under static conditions. A polished copper strip is immersed in a sample of grease at elevated temperature for a specified period. The strip is examined for corrosion and a classification number from 1-4 is assigned based on a comparison with the ASTM Copper Strip Corrosion Standards.

## Features and Benefits

• Conforms to ASTM D4048 specifications

## Copper Strip Tarnish Test Apparatus

Constant temperature bath immerses 16 test tubes for copper strip tarnish tests of products not requiring a test bomb. Microprocessor temperature controller has °C/°F switchable digital setpoint and display. Operator and equipment are protected by an overtemperature control circuit which automatically interrupts power to the unit should bath temperature exceed a programmed cut-off point. Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. Contact your EXPOTECH USA representative for information. Welded stainless steel double-wall construction with built-in support rack. Fully insulated.

### Specifications

Conforms to the specifications of: ASTM D4048, FTM 791-5309
Capacity: 16 test tubes
Maximum Temperature: 190°C (374°F)
Temperature Control Stability: ±1°C (±2°F)
Bath Medium: 5 gal (18.9L) water or high temperature heater transfer fluid

### Electrical Requirements

115V 50/60Hz, Single Phase, 7.5A
220-240V 50/60Hz, Single Phase, 4A

**Dimensions** lxwxh,in.(cm)
15.5x12.5x14 (39x32x36)
Net Weight: 27 lbs (12.2kg)

### Shipping Information

Shipping Weight: 45 lbs (20.4kg)
Dimensions: 7.8 Cu. ft.

## Ordering Information

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **1408115** | Copper Strip Corrosion Test Tube Bath | 115V 50/60Hz |
| **1844091** | Copper Strip Corrosion Test Tube Bath | 220-240V 50/60Hz |

## Accessories

| Catalog Number | Product Description |
|---|---|
| **2037901** | Test Jar Rack. Inserts in 1408115/1844091 baths to hold sixteen 332-004-001 Test Jars |
| **1402002** | Test Jar for ASTM D4048 |
| **1186691** | Copper Test Strip. Conforming to ASTM specifications |
| **2036069** | Silicone Carbide Paper, 150 grit. For polishing of test strips. Pack of 50 sheets. |



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| Catalog Number | Product Description |
|---|---|
| **1790863** | Silicone Carbide Paper, 240 Grit. For polishing of test strips. Pack of 50 sheets. |
| **1790864** | Silicone Carbide Grain, 150 Grit. For final polishing of test strips. 1 lb package. |
| **2024686** | Polishing Vise. Holds copper strip firmly in place without marring the edges. Stainless steel, mounted on a composition base. |
| **1186692** | ASTM Copper Corrosion Standards. Colored reproductions of tarnished strips encased in plastic. |
| **2023470** | Viewing Test Tube. Protects copper strip during inspection or storage. |
| **2036469** | ASTM 130F Thermometer. Range: 20 to 220°F |
| **2035735** | ASTM 130C Thermometer. Range: –7 to +105°C |

## Roll Stability Tester

### Test Method

Provides an indication of shear stability of lubricating greases by testing the change in worked penetrations after two hours in the roll stability tester.

### Features and Benefits

- Conforms to ASTM D1831 and related specifications
- Single, double and four-unit models
- Microprocessor programmable high accuracy temperature control
- High Temperature model available

**Roll Stability Tester Standard Models** – Roll stability apparatus for shear stability tests on lubricating greases. Rotates steel test cylinders at 10 or 165rpm in a thermostatically controlled environment at temperatures of up to 200°F (93.3°C). Drive system is powered by a rugged ratio motor, and interchangeable drive chain sprockets are easily accessible for converting unit to either operating speed. Microprocessor PID control provides quick temperature stabilization without overshoot and is protected by an overtemperature control circuit that interrupts power should temperature exceed a programmed cut-off point. Dual LED displays provide actual and setpoint temperature values in °C/°F format. Communications software (RS232, etc.), ramp-to-set and other enhanced features are available as extra cost options. A balanced cast aluminum fan and 1200W heater provide efficient, uniform heat distribution. A dial thermometer in the hinged cover displays chamber temperature. Heaters and drive chain mechanism are shielded for operator safety. Insulated steel cabinet and base are finished with a durable polyurethane enamel finish.

**High Temperature Models** – A high temperature model is also available that expands the temperature range to 320°F (160°C). Tests can be conducted using the high temperature model unit for time/temperature specifications beyond those listed in existing D1831.

**Double-unit model**

**Four-unit model**



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**Specifications**
Conforms to: ASTM D1831, MIL-G-10924SA
Maximum Temperature: 200°F (93°C)
Temperature Control Stability: ±2°F (±1°C)

**Electrical Requirements** (Single and double unit models):
115V 60Hz, Single Phase, 10.5A
220-240V 50Hz, Single Phase, 5.5A
220-240V 60Hz, Single Phase, 5.5A

**Included Accessories**
Test Cylinders with threaded end caps and O-ring seals
Test Rollers, steel, 5kg

**Dimensions** lxwxh,in.(cm)
Single-Unit: 16.5x18.4x15 (42x47x38)
Double-Unit: 16.5x18.4x15 (42x47x38)
Four-Unit: 25x18.4x15 (64x47x38)

Net Weight:
Single-Unit: 98 lbs (44.4kg)
Double-Unit: 116 lbs (52.6kg)
Four-Unit: 187 lbs (84.8kg)

**Shipping Information**
Shipping Weight:
Single-Unit: 142 lbs (64.4kg)
Double-Unit: 175 lbs (79.4kg)
Four-Unit: 270 lbs (122.5kg)
Dimensions:
Single-Unit: 7.7 Cu. ft.
Double-Unit: 9.8 Cu. ft.
Four-Unit: 16.6 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| Roll Stability Tester - Standard Models | | |
| **2035172** | Single-Unit Model | 115V 60Hz |
| **2036786** | Single-Unit Model | 220-240V 50Hz |
| **2036190** | Single-Unit Model | 220-240V 60Hz |
| **2036451** | Double-Unit Model | 115V 60Hz |
| **2035850** | Double-Unit Model | 220-240V 50Hz |
| **2036737** | Double-Unit Model | 220-240V 60Hz |
| **2035205** | Four-Unit Model | 115V 60Hz |
| **2036193** | Four-Unit Model | 220-240V 50Hz |
| **2035471** | Four-Unit Model | 220-240V 60Hz |
| Roll Stability Tester - High Temperature Models | | |
| **2038147** | High Temperature Four-Unit Model | 115V 60Hz |
| **2036622** | High Temperature Four-Unit Model | 220-240V 50Hz |
| **2037284** | High Temperature Four-Unit Model | 220-240V 60Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2037028** | Test Cylinder. Plated steel with threaded end caps and O-ring seals. |
| **2035823** | Steel Cylinder Roller |

## Low Temperature Pressure Viscometer

### Test Method

Apparent viscosity is used to evaluate pumpability and handling characteristics of greases and is also suitable for analysis of adhesives, sealants and other semi-solid products. The sample is forced through a capillary by means of a gear pump-driven hydraulic system and the resulting pressure in the system is measured. Apparent viscosity is then calculated from the flow rate and pressure. Eight different capillaries and two pump speeds are used to determine the apparent viscosity at sixteen shear rates.

### Features and Benefits

- Conforming to ASTM D1092 and related specifications
- Mechanically refrigerated low temperature model



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**Low Temperature Pressure Viscometer** – Consists of power, hydraulic and grease systems with refrigerated test chamber. Hydraulic system includes constant displacement gear-driven metering pump, hydraulic oil reservoir with 50-mesh screen, stainless steel tubing, high pressure valve and fittings. Drive motor has interchangeable 40 and 64 tooth gears for two-speed operation. Four interchangeable gauges of 0-60, 0-100, 0-600 and 0-5000psi ranges monitor system pressure.
Supplied with three precision machined grease assemblies, each including piston, caps and thermocouple; set of eight (ASTM Nos. 1-8) stainless steel capillaries; and wrenches for gauge installation and removal. The refrigerated test chamber holds three cylinders at a time for sample preparation. Operating range is from ambient to –65°F (–53.8°C), with stabilityof ±0.5°F (±0.3°C). The refrigeration system uses hermetically sealed, self-lubricating compressors in cascaded configuration to provide efficient cool-down and trouble-free long term operation. Floor-mounted cabinet is constructed of polished stainless steel with a welded reinforced frame.

**Pressure Viscometer** – Complete apparent viscometer meeting ASTM D1092 specifications. Includes power, hydraulic and grease systems and standard accessories as supplied with the Low Temperature Pressure Viscometer but without refrigerated test chamber or stainless steel cabinet. Mounted on a sturdy base having locating feet for permanent benchtop placement.

**Specifications**
Conforms to: ASTM D1092
Operating Range: performs apparent viscosity determinations at sixteen different shear rates
Low Temperature Pressure Viscometer:
Temperature Range: ambient to –65°F (–54°C)
Optional –100°F cooling range available on special order*
Temperature Control Precision: ±0.5°F (±0.3°C) throughout the operating range
Test Chamber Medium: denatured alcohol

**Included Accessories**
Stainless Steel Grease Cylinder
Assemblies (3)
Thermocouples (3)
Set of Stainless Steel Capillaries (Nos. 1-8)
Interchangeable Pressure Gauges (4)
Interchangeable Pump Drive Gears, 40 and 64-tooth
Set of Wrenches (3)

**Dimensions** lxwxh,in.(cm)
Low Temperature Pressure Viscometer: 43.25x30.75x66.25 (110x78x168)
Net Weight: 640 lbs (290.3kg)
Pressure Viscometer: 30x12x36 (76x30x91)
Net Weight: 121 lbs (54.9kg)

**Shipping Information**
Low Temperature Pressure Viscometer:
Shipping Weight: 900 lbs (408.2kg)
Dimensions: 89.8 Cu. ft.
Pressure Viscometer:
Shipping Weight: 186 lbs (84.4kg)
Dimensions: 14.8 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| Low Temperature Pressure Viscometer | | |
| **2036841** | Low Temperature Pressure Viscometer | 220-240V 50Hz |
| **2036029** | Low Temperature Pressure Viscometer | 220-240V 60Hz |
| Pressure Viscometer | | |
| **2036056** | Pressure Viscometer | 115V 60Hz |
| **2035164** | Pressure Viscometer | 220-240V 50Hz |
| **2037569** | Pressure Viscometer | 220-240V 60Hz |



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## Accessories

| Catalog Number | Product Description |
|---|---|
| **2036723** | Grease Cylinder Assembly for Low Temperature Pressure Viscometer Includes piston and caps |
| **2038282** | Grease Cylinder Assembly for Pressure Viscometer - (2036056 Series) – Includes piston and caps |
| **2035901** | Capillary Set. Nos. 1-8 |
| **2036362** | ASTM 74C Thermometer. Range: -55.4 to -52.6°C |

## Grease Mobility Test Apparatus

### Test Method

Determines the resistance of lubricating grease to flow under prescribed conditions. Mobility is measured in grams per second by pumping the sample through a standardized SOD pressure viscometer at controlled temperature and pressure.

### Features and Benefits

- U.S. Steel Method; ASTM Draft Method
- Test temperatures as low as –30°F (–34.4°C)

### Grease Mobility Test Apparatus

Performs grease mobility tests at low temperatures to predict pumpability characteristics. Determines the suitability of greases for applications in centralized or bulk systems where pumps, valves or pipes are used to distribute or transfer grease. Consists of pressure viscometer, cooling bath and refrigeration system. The stainless steel pressure viscometer is fitted with a modified No.1, 40:1 ratio capillary. After the sample is loaded in the pressure viscometer, the assembly is installed in the cooling bath and allowed to reach the test temperature. Mechanically refrigerated cooling bath can attain test temperatures as low as –30°F (–34.4°C) with stability of ±2°F (±1°C). With the sample at the test temperature, the flow of grease is started under the selected pressure on a nitrogen tank regulator. Flow per second is determined by collecting the grease for a specified period. Includes sample collector turntable.

**Specifications**
Conforms to: U.S. Steel Method; ASTM Draft Method
Minimum Temperature: –30°F (–34.4°C)
Control Stability: ±2°F (±1°C)

**Electrical Requirements**
115V 60Hz, Single Phase, 6A
220-240V 50 or 60Hz, Single Phase, 3A

**Included Accessories**
Grease Cylinder (pressure viscometer) with modified No.1, 40:1 capillary
Sample Collector Turntable

**Dimensions** lxwxh,in.(cm)
Cooling Chamber: 12x12x30 (30.5x30.5x76)
Refrigeration Unit: 15x12x12 (38x30x30)
Net Weight: 114 lbs (51.7kg)

**Shipping Information**
Shipping Weight: 188 lbs (85.3kg)
Dimensions: 18.4 Cu. ft.

## Ordering Information

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2037743** | Grease Mobility Appparatus | 115V 60Hz |
| **2035464** | Grease Mobility Appparatus | 220-240V 50Hz |
| **2036527** | Grease Mobility Appparatus | 220-240V 60Hz |

| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2035305** | Grease Cylinder with plunger and fittings |
| **2035343** | Capillary |
| **2036054** | Thermometer dial type. Range: -100 to +100°F, with 2°F subdivisions |

## Low Temperature Torque Test Apparatus

### Test Method

Significant for the design and specification of greases for low temperature service, the low temperature torque test measures the extent to which a grease sample retards rotation of a bearing assembly at the test temperature.

### Features and Benefits

- Digital torque indication for two samples
- Choice of test rig combinations
- Mechanically refrigerated, with standard –65°F (–54°C) operating range
- Optional cooling range to –100°F (–73°C)
- Optional strip chart recorder or data acquisition software
- Conforms to ASTM D1478, D4693 and D4950 specifications
- Data acquisition software available

### Low Temperature Torque Test Apparatus

Refrigerated two unit apparatus for ASTM low temperature torque tests on lubricating greases. Includes an insulated, thermostatically controlled air chamber with test rigs, drive shafts and externally mounted gear motors. Rotates drive shafts at 1rpm while electronic load cell-strain gauge indicators measure the torque required to restrain the test rigs. Digital LED displays indicate torque for each drive unit and cold chamber temperature. On ASTM D4693 models, spindle temperature is also indicated for each drive unit. An optional factory installed strip chart recorder provides a hard copy record of starting torque, running torque and maximum torque. Includes drive shaft overtorque protection - when drive shaft torque exceeds a preset value, the drive motors automatically shut down to prevent breakage of shaft insulators. Standard cooling range of –65°F (–54°C) meets ASTM requirements for D1478 and D4693 test methods. Optional –100°F (–73°C) range is available for special testing requirements.

**ASTM D1478 Model for Ball Bearing Greases** – Equipped with two test cages and two 6204 ball bearings per ASTM D1478 specifications.

**ASTM D4693 Model for Automotive Wheel Bearing Greases** – Equipped with two spring loaded spindle-bearings-hub assemblies, bearing packer assembly and bearing installation and removal tools.

**Combined ASTM D1478 - D4693 Model** – Equipped with one test cage and one 6204 ball bearing for ASTM D1478 testing and one spindle-bearings-hub assembly with bearing packer and tools for ASTM D4693 testing.

**Data acquisition software** – Data acquisition software facilitates running both ASTM D1478 and D4693 tests. Graph of torque versus time details starting torque, running torque and time elapsed. Includes software, data acquisition board and cable.

**Specifications**

Conforms to: ASTM D1478, D4693, D4950; FTM 791-334
Cooling Range:
Standard: –65°F (–54°C)
Optional: –103°F (–75°C)
Temperature Uniformity: ±0.1°F (±0.5°C)
Refrigeration: air cooled mechanical cascade hermetic system
Cabinet: floor-mount, polished stainless steel exterior, rides on swivel casters

**Dimensions** lxwxh,in.(cm)
48.5x34x45.5 (123x86x116)
Net Weight: 600 lbs (272.2kg)

**Shipping Information**

Shipping Weight: 697 lbs (316.1kg)
Dimensions: 6.4 Cu. ft.

| Ordering Information | | | | |
|---|---|---|---|---|
| **Catalog Number** | **Test Method** | **Electrical Requirements** | | **Cooling Range** |
| **2038125** | ASTM D1478 | 220-240V / 60Hz | | -65°F (-54°C) |
| **2037719** | ASTM D1478 | 220-240V / 50Hz | 220-240V 50/60Hz | -65°F (-54°C) |
| **2035483** | ASTM D1478 | 220-240V / 60Hz | 220-240V 50/60Hz | -103°F (-75°C) |
| **2037445** | ASTM D1478 | 220-240V / 50Hz | 220-240V 50/60Hz | -103°F (-75°C) |
| **2036159** | ASTM D4693 | 220-240V / 60Hz | 220-240V 50/60Hz | -65°F (-54°C) |
| **2035487** | ASTM D4693 | 220-240V / 50Hz | 220-240V 50/60Hz | -65°F (-54°C) |
| **2035131** | ASTM D4693 | 220-240V / 60Hz | 220-240V 50/60Hz | -103°F (-75°C) |
| **2037176** | ASTM D4693 | 220-240V / 50Hz | 220-240V 50/60Hz | -103°F (-75°C) |
| **2037991** | Combined ASTM D1478 and D4693 | 220-240V / 60Hz | 220-240V 50/60Hz | -65°F (-54°C) |
| **2036239** | Combined ASTM D1478 and D4693 | 220-240V / 50Hz | 220-240V 50/60Hz | -65°F (-54°C) |
| **2035701** | Combined ASTM D1478 and D4693 | 220-240V / 60Hz | 220-240V 50/60Hz | -103°F (-75°C) |
| **2035771** | Combined ASTM D1478 and D4693 | 220-240V / 50Hz | 220-240V 50/60Hz | -103°F (-75°C) |

| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2037370** | Data Acquisition Package |
| **2035174** | Test Bearing, 6204. For ASTM D1478 |
| **2037167** | Inboard Test Bearing. For ASTM D4693, LM-67010-LM-67048 tapered roller bearing |
| **2036268** | Outboard Test Bearing. For ASTM D4693, LM-11910-LM-11949 tapered roller bearing |

## High Temperature Wheel Bearing Grease Tester

### Test Method

Evaluates the high temperature stability of automotive wheel bearing greases in a modified automotive front wheel hub-spindle-bearings assembly. The ASTM D3527 Life Performance test employs severe conditions (25 lbf (111N) thrust load, 1000rpm, 160°C spindle temperature) to induce grease deterioration and failure. The test continues in a 20/4 hour on/off cycle until grease breakdown causes measured drive motor torque to increase past an established end point. The number of hours to failure is the test result. The ASTM D4290 Accelerated Leakage Tendencies procedure employs similar test conditions for a 20 hour period, after which leakage of grease and oil is measured and the bearings are washed and examined for deposits of gum and varnish.

### Features and Benefits

- Conforms to ASTM D3527, D4290 and D4950 specifications
- Fully automatic operation
- Digital monitoring of all test functions

### High Temperature Wheel Bearing Grease Tester

Performs life performance and accelerated leakage tendencies tests on lubricating greases in accordance with ASTM test specifications.

Consists of a modified front wheel hub-spindle-bearings assembly housed in a constant temperature oven and coupled to a 1/4hp variable-speed drive motor. Controls test functions automatically and provides continuous digital display of motor torque, rpm, chamber temperature, spindle temperature, time cycle and elapsed time. Test parameters outside of ASTM specifications can be selected by the operator for in-house testing. Automatically terminates test and displays elapsed on-cycle hours when grease deterioration causes drive motor torque to increase to the calibrated end point. A built-in thirty second time delay circuit prevents

erroneous test terminations due to momentary surges in motor torque at the beginning of the on-cycle. Insulated constant temperature oven is equipped with a 1200W heater and balanced 1/20 hp circulation fan for efficient heat distribution. Sliding access doors and a movable platform that swings the drive motor out of the way provide easy access to the spindle assembly. Modified steel spindle and hub assembly conforms to all critical 1971 Chevy II dimensions and is fitted with thermocouple, bearing thrust loading device and anodized aluminum grease collector. All controls and monitors are housed in a separate cabinet.

**Specifications**
Conforms to: ASTM D3527, D4290, D4950
Digital controls and displays:
Timer: on/off cycle and real time
Chamber Temperature: °C
Spindle Temperature: °C
Motor rpm: 0-1725rpm
Motor Torque: current draw
Elapsed Time: 9999.9 hr.
Maximum Temperature: 177°C (350°F)

**Electrical Requirements**
115V 60Hz, Single Phase, 13A
220-240V 50Hz, Single Phase, 7A
220-240V 60Hz, Single Phase, 7A

**Included Accessories**
Thermocouples (2)
Thermometer holder
Bearings (1 set)
Grease Packer Assembly
Bearing Installation/Removal Tools:
bearing installer, small and large bearing cup removers, bearing cup installer, bearing puller and spindle wrenches (pins)

**Dimensions** lxwxh,in.(cm)
Test Unit: 16x20x15.75 (41x51x40)
Control Unit: 16x14x16 (41x36x41)
Net Weight: 145 lbs (65.8kg)

**Shipping Information**
Shipping Weight: 230 lbs (104.3kg)
Dimensions: 14.8 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2037727** | High Temperature Wheel Bearing Grease Tester | 115V, 60Hz |
| **2038137** | High Temperature Wheel Bearing Grease Tester | 220-240V, 50Hz |
| **2036143** | High Temperature Wheel Bearing Grease Tester | 220-240V, 60Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2035955** | ASTM 42C Thermometer. Range: 95 to 255°C |
| **2036960** | Inboard Bearing Set. Includes LM67048 Cone and LM67010 Cup |
| **2038011** | Outboard Bearing Set. Includes LM11949 Cone and LM11910 Cup |

## Water Washout Tester

### Test Method
A grease sample is packed in a ball bearing and subjected to a steady water stream under controlled test conditions. The percentage of grease washed out in a one hour period is determined by weight.

### Features and Benefits
• Conforms to ASTM D1264, D4950 and related specifications

### Water Washout Tester
Rotates a lubricated ASTM ball bearing at 600rpm in a modified bearing/housing assembly while impinging the bearing with a jet of water at the specified flow rate and temperature. The tared bearing and bearing shields are weighed before installation in the bearing housing and again after testing and drying to determine the amount of sample loss. Consists of reservoir, bearing housing, circulation system and drive motor. Reservoir is equipped with cartridge heater, thermoregulator and thermometer port for accurate temperature control at 100°F and 175°F (38°C and 79°C) per ASTM specifications. Circulation system includes constant velocity carbon bearing gear pump, valves and flowmeter directing

a controlled water flow to a capillary (1mm) spray nozzle aimed at the bearing housing. Rugged 1/3hp drive motor rotates test bearing at 600rpm while driving the circulation pump. A two-pulley system permits independent pump operation to circulate water while heating it to test temperature. Mounted on a finished steel base with locating feet for permanent benchtop placement.

**Specifications**

Conforms to: ASTM D1264, D4950; IP 215; FTM 791-3252

Drive Motor: 1/3hp 1725rpm

Temperature Control: ±1°F (±0.5°C) sensitivity

**Electrical Requirements**

115V 60Hz, Single Phase,10.1A

220-240V 50Hz, Single Phase, 5.1A

220-240V 60Hz, Single Phase, 5.1A

**Included Accessories**

Ball Bearing (2)

Drive Train Guard

Acrylic Reservoir Cover

Outer Bearing Shield

Inner Bearing Shield

Test Bearing

**Dimensions** lxwxh,in.(cm)

18x12x18.75 (46x30x48)

Net Weight: 67 lbs (30.4kg)

**Shipping Information**

Shipping Weight: 102 lbs (46.3kg)

Dimensions: 6.7 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2035989** | Water Washout Tester | 115V, 60Hz |
| **2036541** | Water Washout Tester | 220-240V, 50Hz |
| **2037554** | Water Washout Tester | 220-240V, 60Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2035174** | Test Bearing |
| **2038060** | Outer Bearing Shield |
| **2035067** | Inner Bearing Shield |
| **2036433** | ASTM 15F Thermometer. Range: 30 to 180°F |
| **2036911** | ASTM 15C Thermometer. Range: -2 to +80°C |

# Water Spray Apparatus

## Test Method

Evaluates the ability of a lubricating grease to adhere to a metal surface when subjected to a direct water spray under controlled conditions. The percentage of grease sprayed off a stainless steel test panel after a specified period is determined by weight.

## Features and Benefits

- Conforms to ASTM D4049 specifications
- Improved spray chamber design

## Water Spray Apparatus

Complete Water Spray Apparatus meeting ASTM specifications, including spray chamber, delivery system and constant temperature reservoir. Sprays water at the specified rate and temperature on a test panel coated with sample grease. To test for water spray resistance, fill reservoir with 8L of tap water and set thermostat at test temperature. Circulate the water through the system to attain temperature equilibrium and insert the coated test panel in the spray chamber. Adjust water spray to 40psi (276kPa) and continue for 5 minutes. Water spray system includes 1/3hp positive displacement pump; spray nozzle with snubber fitting: 0-60psi pressure gauge; bypass valve; shut-off and drain valves; and flexible high pressure water lines. Hinged acrylic spray chamber cover is recessed into the chamber housing to insure watertight operation. Two thermometer wells permit separate monitoring of reservoir and water spray temperatures. Standardized grease application fixture coats test panel with the required thickness of sample grease. Uses tap water; does not require water hookup.

**Specifications**
Conforms to: ASTM D4049
Circulation System:
Drive Motor: 1/3hp, 1725rpm
Pump: rotary gear positive displacement type
Pressure Gauge: 0-60psi
Temperature Control Stability: ±1°F (±0.5°C)

**Electrical Requirements**
115V 60Hz, Single Phase, 13.3A
220-240V 50Hz, Single Phase, 6.8A
220-240V 60Hz, Single Phase, 6.8A

**Included Accessories**
Stainless Steel Test Panel
Grease Application Fixture

**Dimensions** lxwxh,in.(cm)
29x18x33.5 (74x46x85)
Net Weight: 110 lbs (49.9kg)

**Shipping Information**
Shipping Weight: 180 lbs (81.6kg)
Dimensions: 14.2 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2036687** | Water Spray Apparatus | 115V, 60Hz |
| **2036475** | Water Spray Apparatus | 220-240V, 50Hz |
| **2035498** | Water Spray Apparatus | 220-240V, 60Hz |



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| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2038115** | ASTM 37C Thermometer. Range: -2 to +52°C |
| **2037722** | Stainless Steel Test Panel |
| **2037495** | Grease Application Fixture |

## Oil Separation Apparatus For ASTM D6184

### Test Method

Determines the tendency of oil and lubricating grease to separate at elevated temperature.

### Features and Benefits

• Conforms to ASTM D6184 and FTM 791-321 specifications

### Oil Separation Apparatus

Consists of 60 mesh nickel gauze cone with wire handle, tall form 200mL beaker and cover with hook. Place sample in wire gauze cone and determine weight loss after heating at test temperature for specified time period. Withstands test temperatures of up to 900°F (482°C).

**Specifications**

Net Weight: 0.5 lb (0.2kg)

Shipping Weight: 1 lb (0.45kg)

| Ordering Information | |
|---|---|
| **Catalog Number** | **Product Description** |
| **1792860** | Oil Separation Apparatus |

## Oil Separation Apparatus For IP121

### Test Method

Provides a measure of the stability of lubricating grease towards oil separation during storage.

### Features and Benefits

• Conforms to IP 121 specifications

### Oil Separation Apparatus

Consists of stainless steel separation cup with cone of 240 mesh woven wire cloth, 100g metal weight and oil cup. Oil separation is determined

by placing the sample on the wire mesh cone and loading it with the 100 metal weight. The percentage of sample weight lost is calculated after a storage period of 42 hours.

**Specifications**
Net Weight: 0.75 lb (0.34kg)
Shipping Weight: 1 lb (0.45kg)

| Ordering Information | |
|---|---|
| **Catalog Number** | **Product Description** |
| **1795607** | Oil Separation Apparatus. |

## Oil Separation Apparatus For ASTM D1742

### Test Method
Determines the tendency of lubricating grease to separate oil during storage in a 35 lb pail. The sample is placed on a sieve inside a special test cell and subjected to 0.25psi (1.72kPa) air pressure at constant temperature. Any oil that bleeds from the grease during a 24 hour period is collected in the cell and weighed.

### Features and Benefits
- Conforms to ASTM D1742 and related specifications
- Four sample capability
- Controls temperature and air pressure

### Oil Separation Apparatus
Consists of pressure bleeding test cells with air pressure regulation system and constant temperature air cabinet.

**Pressure Bleeding Test Cell** – Type A test cell includes cup assembly with funnel and positioning seat for beaker; cover with air inlet fitting; and 200-mesh stainless steel sieve strainer with brass support ring. Bayonet type connection and o-ring seal provide tight closure between cover and base. Cup, funnel and base are constructed of chrome plated spun copper. Order test beaker separately.

**Constant Temperature Air Cabinet** – Provides a constant temperature environment and regulated air pressure per ASTM specifications. Consists of an insulated airtight cabinet with pressure system to accommodate four pressure bleeding test cells. Equipped with electric heater, solid state controller, cooling coil and circulating fan for efficient temperature control at 77°F (25°C). Pressure system includes air inlet pressure regulator with gauge, cartesian manostat, manifold with control valves for four test cells, output gauge, manostat and gas washing bottle. Built-in pressure relief valve protects against pressure surge. Cabinet is constructed of double-wall stainless steel with full insulation. Order thermometer and pressure test cell separately.

**Specifications**
Conforms to: ASTM D1742, FTM 791-322
Capacity: four samples
Controller Sensitivity ±1°F (±0.5°C)

**Electrical Requirements**
115V 50/60Hz, Single Phase, 3A
220-240V 50/60Hz, Single Phase, 1.5A

**Dimensions** lxwxh,in.(cm)
Interior: 19.75x19.75x21.5 (50x50x55)
Overall: 47*x23.75x31.25 (119x60x79)
*includes external pressure system components
Net Weight: 121 lbs (54.9kg)

**Shipping Information**
Shipping Weight: 224 lbs (101.6kg)
Dimensions: 27.8 Cu. ft.



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| Ordering Information | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Electrical Requirements** |
| **1795189** | Constant Temperature Air Cabinet | 115V 50/60Hz |
| **1795190** | Constant Temperature Air Cabinet | 220-240V 50/60Hz |
| **1795191** | Pressure Bleeding Test Cell | |

| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **1795192** | Test Beaker, 20mL |
| **1795193** | ASTM 57F Thermometer. Range: -4 to +122°F |
| **1795194** | ASTM 57C Thermometer. Range: -20 to +50°C |

## Deleterious Particles Determination Apparatus

### Test Method

Detects and estimates deleterious particle contamination in lubricating greases and other semi-solids and heavy liquids. Grease fillers can be tested for abrasive contaminants by first mixing them into petroleum or grease known to be free of deleterious particles.

### Features and Benefits

• Conforms to ASTM D1404 specifications

### Deleterious Particles Determination Apparatus

Complete apparatus per Figure 1 and 2 of ASTM D1404. Rotates plastic plate 30° against stationary plate while applying 200psi pressure. Includes body, test plate holders, loading screw, calibrated spring with scale for applying test load and removable cap assembly with milled slot and handle for rotating test plates. Constructed of stainless steel. Order plastic test plates separately.

**Specifications**
Net Weight: 5.5 lbs (2.5kg)
Shipping Weight: 8 lbs (3.6kg)

| Ordering Information | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2037764** | Deleterious Particles Determination Apparatus |



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| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2035581** | Plastic Test Plate. For use in Model 2037764. Highly polished. Two (2) required for each test. |

## Lincoln Ventmeter

### Test Method

The 2035688 Lincoln Ventmeter evaluates the ventability of grease, which is useful in determining by consistency what type of greases can be used in a centralized automatic lubrication system. Furthermore, the size or diameter of the supply line in an automatic lubrication system can be accurately determined for a particular type of grease. Pressurizing lubricant grease in 25 feet coil tube to 1800 psi with a grease gun, opening the venting valve and reading the pressure on the gage after 30 seconds will provide the supply line size and maximum supply line information for the tested grease by referring the supplied grease ventmeter reading to supply line reference charts after measuring of the grease ventablility.

### Lincoln Ventmeter

Lincoln Ventmeter, as a simulation device of a centralized lubrication system, consists of 25 feet coil tube with valve 1 at the pressure gage end and valve 2 at the end where a level grease gun is connected. Build up pressure with the grease gun attached when valve 1 closed. Open instantly valve 2 when pressure gage reading stabilizes at 1800 psi. Read the pressure gage after venting for 30 seconds. Repeat test three times and take an average reading to determine supply line pipe size and maximum length of supply line.

**Test under Different Temperature** ñ The test could be done under any temperature as application required. The standard test recommend three temperature: 0ƒF, 30ƒF and 75ƒF. When testing under temperature other than the ambient, the ventmeter filled with grease should be put in temperature chamber for at least 4 hours. The same test steps should be used for different temperature conditions.

**Specifications**
Model: 2035688
Electrical Requirements: None

**Dimensions** lxwxh,in.(cm)
Overall: 15”x6”x5”

**Shipping Information**
Shipping Weight: 12 lbs
Dimensions: 16”x10”x6”

| Ordering Information | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Order Qty** |
| **2035688** | Lincoln Ventmeter | 1 |

## BITUMENS & WAXES TESTING EQUIPMENT


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## Ductility and Elastic Recovery of Bituminous Materials

### Test Method

Determines the ductility of a bituminous material by measuring the distance in which a sample will elongate before breaking when two ends of a briquet specimen of the test material are pulled apart at a specified speed and temperature. Elastic Recovery is determined by pulling the briquet specimen to a specified distance at a specified speed and temperature. The briquet is then cut and the distance in which it takes for the two halves to reconnect is used to determine the elastic recovery of the test sample.

### Semi-Automatic Ductility Testing Machine

- Conforms to ASTM D113, D6084 and related specifications
- Standard and Constant Temperature Models available
- Capable of testing up to 3 samples simultaneously
- 6" LCD Touch Screen Control Panel
- Pre-programmed with Ductility, Recovery, and Custom test methods
- Maximum travel length of 150 cm
- Variable traction speed from 0.25 to 7.0 cm/min
- Constant Temperature model equipped with Lexan Cover for enhanced temperature stability.

Semi-Automatic Ductility Testing Machine designed explicitly for testing the ductility and elastic recovery of bituminous materials. Features a 6" LCD touch screen control panel. This integrated touch screen allows the user to choose between the ductility or recovery test methods. The custom menu allows for the input of desired speed and time parameters. During testing, the distance traveled by the specimen is displayed and a simple touch of the screen can record the distance traveled upon breakage of the briquet. A motor jogging feature permits locking of the sample carriage without additional movement after briquet sample is loaded into the machine.

**Test under Different Temperature** ñ The test could be done under any temperature as application required. The standard test recommend three temperature: 0ƒF, 30ƒF and 75ƒF. When testing under temperature other than the ambient, the ventmeter filled with grease should be put in temperature chamber for at least 4 hours. The same test steps should be used for different temperature conditions.

**Specifications**

Conforms to the specifications of:
ASTM D113, D5892, D6084, P226; IP 32, 516; DIN 52013, EN 13398; NF T 66-006; AASHTO T 51, T 301; JIS K2207
Capacity: 3 molds with samples
Maximum Travel Length: 150 cm
Standard Traction Speed: 5 cm/min
Variable Traction Speed: 0.25 to 7.0 cm/min
Timer: 1-999 min

**Included Accessories**

Standard Model:
Standard Mold (3)
Base Plate
Constant Temperature Model:
Circulation Bath
Remote Temperature Probe, 10 ft. length
Connection Tubing
Standard Mold (3)
Base Plate
Lexan Cover

**Dimensions** wxdxh,in.(cm)
Standard Model: 86.25x 19 x 16" (219.1 x 48.3 x 40.6)
Constant Temperature Model: 86.25 x 19 x 16 (219.1 x 48.3 x 40.6)
Circulation Bath: 15.75 x 8.25 x 22.5" (40 x 21 x 57.1cm)
Net Weight:
Standard Model: 200 lbs (91.7kg
Constant Temperature Model: 217 lbs (98.5 kg)
Circulation Bath: 50 lbs (22.7 kg)

**Electrical Requirements**

115V 60Hz
230V 50/60Hz

**Shipping Information**

Standard Model:
Shipping Weight: 350 lbs (159kg)
Dimensions: 923/4x 251/4x 231/4" (235.6 x 64.1 x 59.1cm)
Constant Temperature Model:
Shipping Weight: 368 lbs (167kg)
Dimensions: 923/4x 251/4x 231/4" (235.6 x 64.1 x 59.1cm)
Circulation Bath:
Shipping Weight: 74 lbs (34kg)
Dimensions: 22 x 101/2 x 261/2" (55.9 x 26.7 x 67.3 cm)



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| Ordering Information | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2297812** | Semi-Automatic Standard Ductility Testing Machine, 115/230V 50/60Hz |
| **2297811** | Semi-Automatic Constant Temperature Ductility Testing Machine, 115V 60Hz |
| **2308328** | Semi-Automatic Constant Temperature Ductility Testing Machine, 230V 50/60Hz |

| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2308330** | Standard Mold |
| **2036256** | Recovery Mold |
| **2025338** | Base Plate |
| **2037140** | ASTM 63F Thermometer Range: 18 to 89°F |
| **2035138** | ASTM 63C Thermometer Range: -8 to 32°C |

## Force Ductility Mold

### Test Method

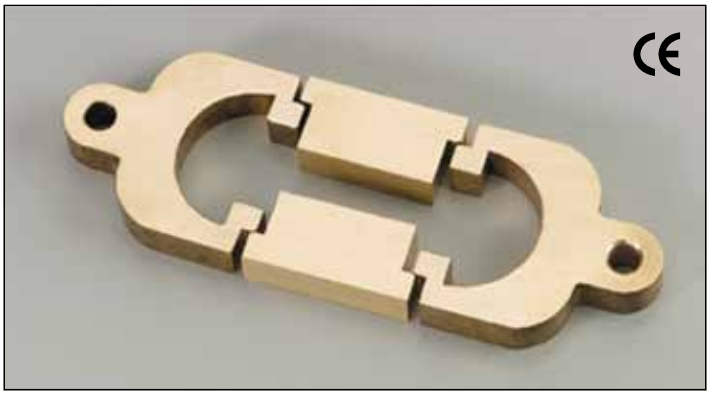
Evaluates the tensile properties of bituminous materials by measuring the force required to elongate a briquet specimen under controlled laboratory conditions.

### Features and Benefits

- Electronic force measurement with digital indication
- Analog output signal for computer interface

### Force Ductility Mold

Measures the force exerted on a briquet specimen in a standard ductility machine. Use for evaluating the tensile properties of bituminous materials, including asphalt cements, asphalt emulsion residues, polymer modified asphalt cements, and polymer modified asphalt emulsion residues, and for measuring the stress relaxation properties of bituminous materials used in the roofing industry and in the pavement joint sealant industry. Installs easily in the standard or constant temperature ductility machine–no tools are required. Adapter incorporates a linear variable differential transformer (LVDT) to electronically measure the force exerted on the specimen. Stainless steel construction prevents rust and corrosion, and all electrical components are located outside of the water bath. Included digital indicator unit incorporates a power supply for the LVDT and a 0-2 VDC analog output signal for interfacing with a computer data acquisition system, strip chart recorder or datalogger.



**Specifications**
Conforms to: ASTM P226
Accuracy: ±0.01 pounds

**Included Accessories**
Weight Holder for Calibration of Adapter

**Dimensions** lxwxh,in.(cm)
Adapter: 5.625x1.75x6 (14x4x15)
Digital Indicator Unit: 10x12x3 (25x30x8)

**Shipping Information**
Shipping Weight: 20 lbs (9.1kg)
Dimensions: 3.4 Cu. ft.

| Ordering Information | | |
|---|---|---|
| **Catalog Number** | **Product Description** | **Electrical Requirements** |
| **2036872** | Force Measuring Adapter | 115V 60Hz |
| **2037272** | Force Measuring Adapter | 220-240V 50/60Hz |



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| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2036256** | Force Ductility Mold. Includes interlocking brass clips and slides per ASTM D-4/P226 specifications |
| **2025338** | Base Plate |

## Softening Point Apparatus

### Test Method

The sample is cast in shouldered rings and heated at a controlled rate under the weight of a steel ball. The softening point is the temperature at which the bitumen disks soften and sag downward a specified distance.

### Features and Benefits

• Conforms to ASTM D36 and related specifications

### Softening Point Apparatus

Consists of 800mL beaker, 2 standard balls, shouldered rings, ball centering guides, ring holder, bottom plate and beaker cover with support rods. Order thermometer and heater separately

**Specifications**

Conforms to the specifications of: ASTM D36, E28; AASHTO T53; IP 58, 198; NF T 66-008

**Shipping Information**

Shipping Weight: 4 lbs (1.8kg)

| Ordering Information | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2035847** | Softening Point Apparatus |

| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **1340238** | Powertrol Heater, 115V 50/60Hz. 750W heater with variable stepless control and porcelain refractory to plate with positioning well for beaker. Enclosed in a stainless steel housing with cooling vents, Shipping Weight: 9 lbs (4.1kg). |
| **2035439** | Powertrol Heater, 220-240V 50/60Hz |
| **2036433** | ASTM 15F Thermometer. Range: 30 to 180°F |
| **2036911** | ASTM 15C Thermometer. Range: –2 to +80°C |
| **2036992** | ASTM 16F Thermometer. Range: 85 to 392°F |
| **2036464** | ASTM 16C Thermometer. Range: 30 to 200°C |
| **2036896** | ASTM 113F Thermometer. Range: 30 to 350°F |
| **2036749** | ASTM 113C Thermometer. Range: –1 to +175°C |
| **1087604** | Ring. Brass, shouldered ring conforming to ASTM specifications. Pack of 10. |
| **2037883** | Ball. Hardened stell, conforming to ASTM specifications. Pack of 10. |
| **2035550** | Ball-Centering Guide. |

# Automatic Softening Point Apparatus

## Test Method

The sample is cast in shouldered rings and heated at a controlled rate under the weight of a steel ball. The softening point is the temperature at which the bitumen disks soften and sag downward a specified distance.

## Features and Benefits

- Conforms to ASTM D36 and related test specifications
- Optical detectors for automatic measurement of softening point
- Overtemperature protection circuitry

## Automatic Softening Point Apparatus

The Automatic Softening Point Apparatus features a microprocessor-based controller, an automatic load ball applicator, two optical detectors, and two test positions for measuring the softening point of bitumens, waxes, and other solid to semi-solid products. The instrument maintains program sequences for both water and glycerin bath tests as well as a user-defined program. A low-mass heating device along with the microprocessor-controlled stirring device and Pt-100 sensor maintain the proper bath heating rate as prescribed by the test method. The dual independent optical detection system provides accurate and precise measurement of the softening point for up to two individual samples without operator intervention. The backlit LCD display shows the expected softening point as entered by the operator and the actual bath temperature during the test for both positions. The test results can be exported through the RS-232 interface. For added safety, the integrated safety device interrupts power if an overtemperature situation occurs.

**Specifications**

Conforms to the specifications of: ASTM D36, E28; AASHTO T53; IP 58; ISO 4625; DIN 52011; NF T 66-008; EN 1427, 13179

**Included Accessories**

Glass Beaker
Ring and Ball Support with Temperature Probe
Test Rings (10)
Load Balls (10)
Ball Application and Centering Guide

**Shipping Information**

Shipping Weight: 42 lbs (19kg)
Dimensions: 4.9 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2251711** | Automatic Softening Point Apparatus | 115V 50/60Hz |
| **2043170** | Automatic Softening Point Apparatus | 230V 50/60Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2043173** | Shouldered Ring, pack of 10 |
| **2043180** | Load Ball, pack of 10 |



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## Breaking Point Apparatus

### Test Method

Determines the breaking point of solid and semi-solid bitumens. A thin steel plaque is coated with the sample and flexed in a bending apparatus at descending temperatures until cracks appear in the sample coating.

### Features and Benefits

• Conforms to IP 80 specifications

### Breaking Point Apparatus

Consists of two concentric borosilicate glass tubes with movable steel plate holders. A cone-and-peg mechanism moves the inner tube up and down relative to the outer tube, which varies the distance between the plate holders, causing the stainless steel test plate to be flexed. The inner tube accommodates a test thermometer. Supplied with 12 spring stainless steel plaques.

**Specifications**
Shipping Weight: 20 lbs (9.1kg)
Dimensions: 2.5 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description |
|---|---|
| 2036698 | Breaking Point Apparatus |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| 2036880 | Cooling Apparatus. Consists of test tubes, cylinder bungs and thistle tunnel |
| 2035382 | Electric Hotplate, 115V 50/60Hz |
| 2035681 | Electric Hotplate, 220-240V 50/60Hz |
| 1797870 | ASTM 33C Thermometer. Range: -38 to +42°C |

## Thin Film Asphalt Oven for ASTM D6 & D1754

### Test Method

Determines the effect on asphaltic materials of heating in an oven under prescribed conditions. The results are reported in terms of change in sample mass and/or changes in selected properties such as viscosity, penetration and ductility as evidenced by test data taken before and after the oven cycle.

### Thin Film Asphalt Oven

Dual purpose oven for loss of heat test and thing film test for bitumen and asphaltic materials. Interior chamber of stainless steel and stored powder painter steel exterior. Double glazed window in door for viewing test chamber. Side mounted controls comprise microprocessor digital control, independent overheat thermostat, mains switch and indicator lamps. Two rotating platforms supplied to perform both the tests.

**Specifications**
Conforms to: ASTM D6, D1754; Specification E145, Type 1B; AASHTO T49, T179; BS2000
Pre-sent at 163°C ±1°C
Temperature Range: to 356°F (180°C)

**Electrical Requirements**
115V 60Hz
230V 50Hz

**Dimensions** lxwxh,in.(cm)
Internal Chamber Dimension: 38cm(h) x 52 cm(w) x 46 cm(l)
External Chamber Dimension: 57cm(h) x 87 cm(w) x 63 cm(l)
(External Dimensions does not include motor or handle)
Net Weight: 44 kg

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2343034** | Asphalt Oven | 110V 60Hz |
| **2043430** | Asphalt Oven | 220V 50Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2035182** | 3 oz. sample asphalt container for ASTM D6 |
| **2037492** | Thin Film Oven Pan, aluminum for ASTM D1754 |
| **2036753** | Thin Film Oven Pan, stainless steel for D1754 |

## Rolling Thin Film Oven for ASTM D2872

### Test Method

Determines the effect of heat and air on a moving film of asphalt to serve as an indicator of approximate change in properties during conventional hot-mixing. The results are reported in terms of the changes in selected properties such as viscosity, penetration and ductility brought about by the RTFO test, as evidenced by test data taken before and after the 75 minute oven cycle.

### Features and Benefits

• Conforms to the specifications of ASTM D2872

### Rolling Thin Film Oven

Double-walled electrically heated convection oven for rolling thin film oven tests on asphalts. Incorporates all required features per ASTM specifications, including: door with double-pane viewing window; symmetrical top and bottom vents; air plenum; squirrel cage-type 1725rpm fan; digital indicating thermostat to control oven temperature at 163 ± 0.5°C; vertical

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circular carriage to mechanically rotate the samples at ± 0.2rpm; air jets to blow heated air into each sample bottle at its lowest point of travel; and a calibrated flowmeter to control air flow at 4000mL/min. An over-temperature cut-off circuit disconnects power to the unit in the event of control failure.

**Specifications**
Conforms to: ASTM D2872

**Included Accessories**
Glass Sample Container (8)
ASTM 13C Thermometer

**Dimensions** lxwxh,in.(cm)
28x26x23 (71x66x58)
Net Weight: 223 lbs (101kg)

**Shipping Information**
Shipping Weight: 276 lbs (125kg)
Dimensions: 7.96 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2037828** | Rolling Thin Film Oven | 220-240V 60Hz |
| **2037113** | Rolling Thin Film Oven | 220-240V 50Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2037546** | Glass Sample Container |
| **2035551** | ASTM 13C Thermometer. Range: 155 to 170°C |

## Float Test Apparatus

### Test Method
Provides a measure of the consistency of bituminous materials, including asphalts and tar products

### Features and Benefits
• Conforms to ASTM D139, AASHTO T50 and ANS A37.2 specifications

### Float Test Apparatus
Consists of aluminum float and three brass collars for determining the consistency of bituminous materials and tar products.

**Shipping Information**
Shipping Weight: 3 lbs (1.4kg)

**Ordering Information**

| Catalog Number | Product Description |
|---|---|
| **2035197** | Float Test Apparatus |

| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2037791** | Float, only |
| **2037255** | Collar, only |
| **2036433** | ASTM 15F Thermometer. Range: 30 to 180°F |
| **2036911** | ASTM 15C Thermometer. Range: -2 to +80°C |

## Residue & Oil Distillate Determination Apparatus

### Test Method

Determines residue and oil distillate in emulsified asphalt for research, quality control and specification acceptance purposes.

### Features and Benefits

• Conforms to ASTM D244 and AASHT0 T59 specifications

### Residue & Oil Distillate Determination Apparatus

Consists of an aluminum alloy still with lid and clamp assembly, ring burner, connection apparatus, graduate cylinder and thermometers.

**Shipping Information**
2036184: Shipping Weight: 7 lbs (3.2kg)
Dimensions: 1.3 Cu. ft.
2036479: Shipping Weight: 18 lbs (8.2kg)
Dimensions: 2.8 Cu. ft.

| Ordering Information | |
|---|---|
| **Catalog Number** | **Product Description** |
| **2036184** | Aluminum Alloy Still |

| Accessories | |
|---|---|
| **Catalog Number** | **Product Description** |
| **1402117** | Ring Burner, 5” (12.7cm) dia |
| **2036479** | Connection Apparatus. Includes Pyrex™ condenser with metal jacket, tin shield, clamps and stand |
| **1428454** | Graduated Cylinder, 100mL |
| **2037206** | ASTM 7F Thermometer. Range: 30 to 580°F |
| **2037416** | ASTM 7C Thermometer. Range: -2 to +300°C |

# Blocking & Picking Points Apparatus

## Test Method

Blocking point and picking point are indicators of the temperature above which surface film injury will occur when waxed surfaces come in contact with one another as on a roll of wax paper. Paper test specimens are coated with the wax sample, folded with the waxed surfaces together, and heated on a metal blocking plate having a measured temperature gradient. After a specified period, the specimens are removed and unfolded, and the points at which film disruption occurred are noted together with their corresponding temperatures.

## Features and Benefits

- Conforms to ASTM D1465 and TAPPI T652 specifications
- Choice of Type A or Type B Blocking Plates

## Blocking & Picking Points Apparatus

Applies wax samples to paper test specimens and creates a temperature gradient for determining blocking point and picking point temperatures.

**Wax Coating Device** – Coats paper with wax samples per ASTM specifications. Consists of an insulated electrically heated hot wax bath and a cooling water bath with doctor rods and paper roller. Variable auto transformer and 200W heater situated underneath the hot wax bath heat sample to a temperature above the melting point. Doctor rods connect to an external hot water supply to maintain proper temperature. Cooling bath has water inlet/outlet fittings, and each bath has a built-in paper guide.

**Blocking Plates** – Choice of Type A or Type B plates per ASTM specifications. Type A Aluminum Blocking Plate uses a strip heater and cooling coil on opposite ends of the block to create a temperature gradient. Six thermocouples along the length of the block input to accessory Digital Thermometer. Accommodates eight rows of paper test specimens. Type B Aluminum Blocking Plate uses two thermostatically controlled baths to establish a temperature gradient, with the ends of the plate extending into the baths. Cold bath has a cooling coil and 100W immersion heater; hot bath has a 300W immersion heater. Thermoregulators and motor stirrers provide uniform temperature control in each bath. Ten thermocouples along the length of the block input to accessory Digital Thermometer. Accommodates six rows of test specimens.

**Digital Thermometer** – Ten-channel microprocessor based digital thermocouple thermometer with large LED display. Ten-position front panel rotary selector switch. Mounted in a heavy duty bench case.

### Specifications

Conforms to the specifications of: ASTM D1465; TAPPI T652

### Electrical Requirements

Wax Coating Device: 115V 50/60Hz, Single Phase, 1.7A
220-240V 5060Hz, Single Phase, 0.9A
Type A Blocking Plate: 115V 50/60Hz, Single Phase, 2.1A
220-240V 50/60Hz, Single Phase, 1.1A
or
Type B Blocking Plate: 115V 50/60Hz, Single Phase, 3.4A
220-240V 50/60Hz, Single Phase, 1.8A

### Included Accessories

Type A Blocking Plate:
Steel weights, 1x1x30”(8)
Sponge rubber pads (8)
IC thermocouples (6)
or
Type B Blocking Plate:
Steel weights, 1x1x6” (24)
Sponge rubber pads (8)
IC thermocouples (10)

### Dimensions lxwxh,in.(cm)

Wax Coating Device: 19x8x12 (48x20x30)
Type A Blocking Plate: 38x12x2 (97x30x5)
Type B Blocking Plate: 19x8x12 (48x20x30)

### Shipping Information

Shipping Weight:
Wax Coating Device: 44 lbs (20kg)
Type A Blocking Plate: 164 lbs (74.4kg)
Type B Blocking Plate: 183 lbs (83.0kg)
Dimensions:
Wax Coating Device: 5.3 Cu. ft.
Type A Blocking Plate: 4.1 Cu. ft.
Type B Blocking Plate: 12.3 Cu. ft.

## Ordering Information

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **Wax Coating Device** | | |
| **2036246** | Wax Coating Device | 115V 50/60Hz |
| **2035049** | Wax Coating Device | 220-240V 50/60Hz |



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| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **Blocking Plates** | | |
| **2037885** | Type A Blocking Plate | 115V 50/60Hz |
| **2036354** | Type A Blocking Plate | 220-240V 50/60Hz |
| **2036652** | Type B Blocking Plate | 115V 50/60Hz |
| **2035956** | Type B Blocking Plate | 220-240V 50/60Hz |

**Accessories**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **Digital Thermometer** | | |
| **2035591** | Digital Thermometer | 115V 50/60Hz |
| **2035078** | Digital Thermometer | 220-240V 50/60Hz |
| **Test Paper** | | |
| **2036353** | Test Paper. Cereal glassine, 30 lb basic weight. 3.5" (8.9cm) wide x 6" (15.25cm) dia. roll on a 3" (7.6cm) dia. core. | |
| **Thermometers -** Use with Type B Blocking Plate only. | | |
| **1793619** | ASTM 9F Thermometer. Range: 20 to 230°F | |
| **2036580** | ASTM 9C Thermometer. Range: -5 to +110°C | |

## Wax Melting Point Apparatus

### Test Method

Periodic temperature measurements are taken of a sample of molten wax as it is cooled in an air bath. When the wax solidifies, a plateau in the cooling curve occurs, indicating the melting point (cooling curve) of the sample.

### Features and Benefits

• Conforms to ASTM D87 and related specifications

### Wax Melting Point Apparatus

Cools molten wax samples in accordance with ASTM and related specifications. Consists of nickel-plated air and water bath assembly with removable cover. Supports test tube in a vertical position in the air bath.

**Specifications**

Conforms to the specifications of: ASTM D87; IP 55; ISO 3841; DIN 51570; FTM 791-1402; NF T 60-114

**Included Accessories**

Test Tube, Thermometer Holders (2)

**Dimensions** dia.xh,in.(cm) 5.5x7 (14x18)
Net Weight 4 lbs (1.8kg)

**Shipping Information**

Shipping Weight: 6 lbs (2.7kg)
Dimensions: 0.7 Cu. ft.

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2035984** | ASTM 14F Thermometer. Range: 100 to 180°F |
| **2036160** | ASTM 14C Thermometer. Range: 38 to 82°C |
| **2035926** | Test Tube, 25x100mm |

**Ordering Information**

| Catalog Number | Product Description |
|---|---|
| **2035215** | Wax Melting Point Apparatus |

# Oil-Solvent Extractables Content Apparatus

## Test Method

Oil content or solvent extractables in wax can affect key properties such as strength, hardness, melting point, etc. The sample is dissolved in methyl-ethyl ketone or a 50-50 mixture of methyl-ethyl ketone and toluene, cooled to precipitate the wax, and filtered. The oil content or solvent extractables content of the filtrate is then determined by evaporating the solvent and weighing the residue.

## Features and Benefits

• Conforms to ASTM D721, D3235 and related specifications

## Oil-Solvent Extractables Content Apparatus

Determines oil content or solvent extractables content in petroleum waxes in accordance with ASTM specifications. Includes Filter Stick Assembly; Cooling Bath; Air Pressure Regulator; and Evaporation Cabinet.

## Filter Stick and Assembly

Filters petroleum wax samples per ASTM specifications. Consists of 10mm diameter sintered glass filter stick with air pressure inlet tube and delivery nozzle, and a 25x170mm test tube. Inserts in Cooling Bath.

## Cooling Bath*

Accommodates three (3) 25x170mm test tubes for cooling samples and filter stick assemblies. Insulated stainless steel tank with finished steel exterior. Removable composition top plate has thermometer port, filling port and three 25.4mm (1") test tube ports. Fill tank with suitable cooling mixture. **A mechanically refrigerated cooling bath is available. Please contact* EXPOTECH USA *sales department for information.*

**Air Pressure Regulator** – Controls air flow to the filter stick assembly at the required rate. Mercury bubbler-type, with 250mL glass cylinder, T-tube and rubber stopper

**Evaporation Cabinet** – Thermostatically heated cabinet evaporates solvent from filtrate per specifications. Accommodates four weighing bottles. Delivers air stream vertically downward into bottles through glass jets. Manifold assembly is adjustable for positioning of jets at the correct height above the sample surface. Controls temperature at 35 ±1°C (95 ±2°F). Finished steel cabinet with composition front plate and hinged glass door.

**Specifications**
Conforms to: ASTM D721, D3235; IP 158; ISO 2908; DIN 51571, 51572; FTM 791-5431

**Electrical Requirements**
115V 50/60Hz, Single Phase, 0.8A
220-240 V 50/60Hz, Single Phase, 0.4A

**Included Accessories**
Weighing Bottles, 15mL (4)
Filter Stick Assembly (2023655)
Air Pressure Regulator (2036726)

**Dimensions** lxwxh,in.(cm)
Cooling Bath: 8x6x9 (20x15x23)
Evaporation Cabinet: 9x5x16 (23x13x41)
Net Weight:
Cooling Bath: 6 lbs (2.7kg)
Evaporation Cabinet: 7 lbs (3.2kg)

**Shipping Information**
Shipping Weight: 24 lbs (10.9kg)
Dimensions: 5 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements | Order Qty |
|---|---|---|---|
| **2036980** | Oil-Solvent Extractables Content Apparatus | 115V 50/60Hz | 1 |
| **2038008** | Oil-Solvent Extractables Content Apparatus | 220-240V 50/60Hz | 1 |

**Accessories**

| Catalog Number | Product Description | Order Qty |
|---|---|---|
| **2272186** | Mechanically Refrigerated Cooling Bath, 115V 60Hz, up to -35°C | |
| **2346879** | Mechanically Refrigerated Cooling Bath, 220-240V 50/60Hz, up to -35°C | |
| **2277655** | Test Tube, 25x170mm | 4 |
| **2035992** | ASTM 71F Thermometer. Range: -35 to +70°C | 1 |

# DISTILLATION


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## Front View Distillation Apparatus

### Test Method

The sample is evaporated and condensed under controlled conditions, and observations are made of the temperatures at which various percentages are recovered and/or the percentages recovered at specified temperatures.

### Features and Benefits

- Conforms to ASTM D86, E133 and related ASTM and international standards
- Choice of three different models

### Front View Distillation Apparatus Front View Distillation Apparatus, Groups 0, 1, 2 and 3 -

Meets all ASTM and related specifications for distillation of motor and aviation gasolines, aviation turbine fuels, naphthas, kerosenes, distillate fuels, natural gasoline, liquid hydrocarbon mixtures and other petroleum products. Consists of fully insulated stainless steel condenser and heater units. Heater unit includes flask support platform, viewing window, 1000W heater with stepless variable control, and rack and pinion heater elevation mechanism with push-turn control knob. Please inquire about higher wattage heaters. White receiving flask background facilitates viewing of fractions during test. Available with right-hand or left-hand heater unit for convenient pairing. Includes graduate support block and flask support boards.

### Group 4 Front View Distillation Apparatus

Front View Distillation apparatus designed for testing of Grade No. 2 fuel oil, Grade No. 2-D diesel fuel oil, gas oils and other distillates requiring condenser bath temperatures of up to 140°F (60°C). Also suitable for gasolines, aviation turbine fuels, naphthas, kerosenes and other liquid petroleum products. Similar in features and construction to the standard Front View Distillation Apparatus, but equipped with a 300W copper immersion condenser heater with stepless electronic control. Available with right or left-hand heater unit. Note: The Group 4 Apparatus can also run distillations for petroleum products categorized as Groups 0, 1, 2 and 3.

**Specifications**

Conforms to the specifications of:
ASTM D86, D216, D233, D447, D850, D1078, E133; IP 123, 195; ISO 3405; DIN 51751; FTM 791-1001, 791-1015; NF M 07-002

**Included Accessories**

Flask Support Boards A and C
Graduate Support Block

**Dimensions** lxwxh,in.(cm)
15.25x18.25x19.5 (39x46x50)

**Shipping Information**

Shipping Weight: 65 lbs (29.5kg)
Dimensions: 13.3 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **Front View Distillation Apparatus** | | |
| **1186712** | Right-Hand Model | 115V 50/60Hz |
| **1418044** | Left-Hand Model | 115V 50/60Hz |
| **1844127** | Right-Hand Model | 220-240V 50/60Hz |
| **1844128** | Left-Hand Model | 220-240V 50/60Hz |

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **Group 4 Front View Distillation Apparatus** | | |
| **1418045** | Right-Hand Model | 115V 50/60Hz |
| **1418046** | Left-Hand Model | 115V 50/60Hz |
| **1844129** | Right-Hand Model | 220-240V 50/60Hz |
| **1844130** | Left-Hand Model | 220-240V 50/60Hz |

**Accessories**

| Catalog Number | Type | Capacity, mL |
|---|---|---|
| **Flasks** | | |
| **2023592** | A | 100 |
| **1793172** | B | 125 |
| **2023593** | C | 200 |
| **1421117** | D | 250 |
| **Graduates** | | |
| **2023594** | A | 25 |
| **1428454** | B | 100 |
| **2023595** | C | 200 |
| **Flask Support Boards** | | |
| **2035770** | A | 1.25 (3.18) |
| **1186714** | B | 1.5 (3.81) |
| **1186715** | C | 2 (5.1) |
| **1186716** | D | 2.75 (6.98) |

**ASTM Distillation Thermometers**

| Catalog Number | Thermometer | Range |
|---|---|---|
| **2037132** | ASTM 2C Partial Immersion | –5 to +300°C |
| **2037206** | ASTM 7F Low Distillation | 30 to 580°F |
| **2037416** | ASTM 7C Low Distillation | –2 to +300°C |
| **2037009** | ASTM 8F High Distillation | 30 to 760°F |
| **1394587** | ASTM 8C High Distillation | –2 to +400°C |
| **2038115** | ASTM 37C Solvents Distillation | –2 to +52°C |
| **2036103** | ASTM 38C Solvents Distillation | 24 to 78°C |
| **2036338** | ASTM 39C Solvents Distillation | 48 to 102°C |
| **2036812** | ASTM 40C Solvents Distillation | 72 to 126°C |
| **2035054** | ASTM 41C Solvents Distillation | 98 to 152°C |
| **2035955** | ASTM 42C Solvents Distillation | 95 to 255°C |
| **2035489** | ASTM 102C Solvents Distillation | 123 to 177°C |
| **2037489** | ASTM 103C Solvents Distillation | 148 to 202°C |
| **2036223** | ASTM 104C Solvents Distillation | 173 to 227°C |
| **2036548** | ASTM 105C Solvents Distillation | 198 to 252°C |
| **2036145** | ASTM 106C Solvents Distillation | 223 to 277°C |
| **2037354** | ASTM 107C Solvents Distillation | 248 to 302°C |

# Automatic Distillation Analyzer 5000 Series for ASTM D86

## Test Method

The sample is evaporated and condensed under controlled conditions, and observations are made of the temperatures at which various percentages are recovered and/or the percentages recovered at specified temperatures.

## Features and Benefits

- Conforms to ASTM D86, D285, D4737 and related international specifications
- Pt-100 RTD probe with automatic temperature calibration system (°C or °F)
- Windows®-based software package for PC control with LIMS export capabilities
- Automatic determination of initial boiling point (IBP), final boiling point (FBP), dry point and barometric and residue corrections
- Diagnostic system continuously ensures proper unit performance and user safety
- Automatic temperature and volume calibration
- Programmable distillation rate (2-15mL/min)
- Ready for distillation groups 0 - 4
- Networking for up to 32 units
- Powerful CFC-free cooling & heating system
- Receiver chamber heating system to 60°C
- Precision level follower system with optical meniscus detector
- Integrated automatic fire extinguishing system with manual operation option

## Automatic Distillation Analyzer 5000 Series

The Automatic Distillation Analyzer is designed to perform optimal distillation analyses of gasolines, fuels, oils, solvents, aromatics, napthas, kerosenes, hydrocarbons, and other volatile products to ensure conformity to rigid quality control standards. The analyzers automatically perform tests, process results, and produce standard reports according to ASTM, ISO, DIN and related international test specifications.

Each Automatic Distillation Unit comes ready with the equipment, accessories, and features as standard to properly run distillation groups 0 to 4 per ASTM D86 and related test specifications. No additional accessories are required. The Windows®-based software package allows simple operator selection of the programmed settings for each distillation protocol. No complicated routines are needed to setup the unit. User-defined programs are easily created for customization of the analyzer.

Dry Point can be detected visually or by automatic detection for ASTM D850 and D1078 test methods. The unit is delivered ready with the PC

board components already included as standard to perform the dry point analysis. It only requires the additional accessories of the dry point thermocouple, 200mL flask, and PTFE plug in order to perform the dry point detection analysis automatically.

## Two Models are Available

The Automatic Distillation Analyzer 5000 series may be ordered for operation with an external PC (purchased separately) or may be ordered with a built-in PC, internal touch screen monitor, virtual keyboard and mouse. An easy-to-use Windows®-based PC communication software expands user capabilities for data analysis and unit control. Distillation methods and parameters can be easily created or modified. Software calculates repeatability and reproducibility as per ASTM D86 as well as standard and deviation against reference materials. Test results are displayed in real-time and can include distillation curve and temperature with or without barometric compensation and/or evaporation correction, distillation rate, heating power curve, master curve comparison, and zoom function for high resolution of heating and temperature curves. The heater compartment is rapidly cooled at the completion of a distillation run to reduce operator downtime. The analyzers are of rugged construction for instrument longevity with a modular design for easy routine maintenance.

## Receiver Chamber Heating System

The receiver chamber heating system is ideal for samples that form waxes or other solids during distillation.



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**Specifications**

Conforms to the specifications of:
ASTM D86, D285, D850, D1078, D4737; D189 Section 10;
DIN 51751; ISO
3405; IP123; JIS J2254; NF M 07-002
Electrical requirements:
120V 50/60Hz 20A
230V 50/60Hz 10A
Temperature
Distillation Range: 0 to 450°C (±0.1°C accuracy)
Condenser: -5 to 60°C (±0.1°C accuracy); closed loop system
Receiver Chamber: 0 to 60°C (±0.1°C accuracy)

Distillation Parameters:
Distillation Rate: 2 to 15 mL/min in 0.1mL increments, user selectable
Receiver Volume: 0 to 100 mL (±0.01mL accuracy) by photoelectric infrared detection of meniscus by level following system utilizing a precision stepper motor and a special calibrated glass receiver; automatic calibration of evaporated loss volume and automatic volume calibration system ensures highest accuracy
Barometric Pressure: Automatic barometric correction utility with automatic sensor, range 550 to 900 mm Hg (±1mm Hg accuracy)
Dry Point Detection: Dry point detection board is included with standard equipment and only requires a dry point sensor, 200 mL flask and PTFE plug for ASTM D850 and D1078 tests.
Environment: Operates at 0 to 45°C (113°F)

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2255127** | Automatic Distillation System | 115V 50/60Hz |
| **2050543** | Automatic Distillation System | 230V 50/60Hz |
| **2052736** | Automatic Distillation System with Color Touch Screen LCD Display and Integrated PC | 115V 50/60Hz |
| **2050544** | Automatic Distillation System with LCD Touch Screen Display and Integrated PC | 230V 50/60Hz |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **1793184** | Automatic Dry Point Detection Kit |

## VDS3000 Distillation of Petroleum Products at Reduced Pressure

### Test Method

Determines the range of boiling points for petroleum products that can be partially or completely vaporized at a maximum liquid temperature of 400°C at reduced pressures. The sample is distilled at a controlled, reduced pressure under conditions that are designed to provide approximately one theoretical plate fractionation. Initial and final boiling point is measured and a distillation curve relating volume percent distilled and the atmospheric equivalent boiling point temperature can be prepared.

## VDS3000 Manual Vacuum Distillation System

- Conforms to ASTM D1160 and related specifications
- Comes standard with glassware set and accessories kit for "Turn-Key" set up and operation
- Sturdy cabinet composed of aluminum frame and cold rolled steel walls
- Control Unit can easily attach and detach from the main unit offering versatility for laboratory workspace
- Clear protective door provides added safety while allowing the operator full view of the system during testing
- Equipped with digital temperature and vacuum displays for improved measurement reading and accuracy
- Upgrade to glassware set composed entirely of quartz available upon request

The VDS3000 Manual Vacuum Distillation System is the latest design for determining, at reduced pressures, the range of boiling points for petroleum products according to ASTM D1160 and related specifications. The main body of the system or cabinet is composed of an aluminum frame and cold rolled steel walls. The base of the cabinet houses a 5 Liter Stainless Steel Surge Tank to reduce pressure fluctuations during testing. The control unit of the system features a versatile, compact, modern design. Dual temperature displays independently show both the overhead and flask temperature of the system. Built in cooling fan rapidly cools the distilling flask allowing the user to handle glassware and shorten turnaround time in between test runs. Equipped with complete glassware set and accessories kit for "Turn-Key" installation and operation of the Vacuum Distillation System.

The Standard Glassware Set consists of 500mL quartz distilling flask with thermowell, vacuum jacketed distilling column and condenser assembly, water jacketed receiving cylinder, 90° elbow adapter tube, Dewar-Type Cold Trap with 10mL graduated receiver and stopcock drain, PT100 probe adapter, PT100 vapor temperature probe and PT100 flask temperature probe. The system also includes an adjustable scissor jack, heating mantle, retaining springs, ball joint clamps, connection tubing, hose clamps, quick connect adapters and fittings for easy connection of jacketed glassware and tubing and vacuum grease.

**Specifications**

Conforms to the specifications of:
ASTM D1160; ISO 6616; JIS K2254
Temperature Range: Ambient to 425°C (797°F)
Temperature Display: 0.1°C resolution
Temperature Accuracy: ±0.5°C
Vacuum Range: 0.1 Torr to Atmospheric Pressure (760 Torr)
Vacuum Display: 0.1 Torr resolution
Vacuum Accuracy: ± 0.2 Torr
External Circulator Temperature Range: Ambient +5°C to 150°C

**Electrical Requirements:**

115V 60Hz
220-240 50/60Hz

**Dimensions** wxdxh,in.(cm)
Cabinet: 29.5x 9.25 x 32.5" (75 x 23.5 x 82.6)
Control Box: 7.75 x 9.25 x 9.75" (19.7 x 23.5 24.7)
Net Weight:
Cabinet: 62 lbs (28.2 kg)
Control Box: 21 lbs (9.6 kg)

**Shipping Information**

Shipping Weight: 120 lbs
Dimensions: 15 Cu.ft.

**Ordering Information**

| Catalog Number | Product Description | Electrical Requirements |
|---|---|---|
| **2297922** | VDS3000 Manual Vacuum Distillation System | 115V 60Hz |
| **2284917** | VDS3000 Manual Vacuum Distillation System | 220-240V 50/60H |

**Accessories**

| Catalog Number | Product Description |
|---|---|
| **2297925** | VDS Vacuum Pump with Kit. Consists of Vacuum Pump, Hose Nozzle, Centering O-Ring, Hinged Clamp, Outlet Filter, Filter O-Ring, Filter Clamp, 1 Liter Vacuum Oil, Connection Tubing, Hose Clamp (2) |
| **2297926** | Standard Constant Temperature Circulation Bath |
| **2301663** | Standard Constant Temperature Circulation Bath |

## Distillation Apparatus for ASTM D95

### Test Method

Determines the water content in petroleum products, tars, emulsified asphalts and other bituminous materials by the distillation method.

### Features and Benefits

• Conforms to ASTM D95, E123, D244 and related specifications

### Distillation Apparatus

Consists of still, ring burner, glassware and all mounting hardware.

**Specifications**

Conforms to the specifications of:
ASTM D95, E123, D244, D370*; AASHTO T55, T59;
API MPMS Ch. 10.5; IP 74, 291; FTM 791-3001; ISO 3733;
NF T 60-113
*requires different glassware–information is available upon request.

**Shipping Information**

2035503: Shipping Weight: 10 lbs (4.5kg)
Dimensions: 1.3 Cu. ft.
2037836/2035177: Shipping Weight: 18 lbs (8.2kg)
Dimensions: 2.8 Cu. ft.

**Ordering Information**

| Catalog Number | Product Description |
|---|---|
| **2035503** | Metal Still. Plated brass and copper, with lid and clamp assembly, gasket and O-ring seal. |
| **1402117** | Ring Burner, 5” (12.7cm) dia. |
| **2037836** | Glassware Set. Includes 400mL condenser, 10mL and 25mL receiving traps. |
| **2035177** | Mounting Equipment. Consists of stand and connecting hardware. |

## Dean & Stark Moisture Test Apparatus

### Test Method

Determines the water content in petroleum products, tars, emulsified asphalts and other bituminous materials by the distillation method.

### Features and Benefits

• Conforms to ASTM D95 and related specifications

### Dean & Stark Moisture Test Apparatus

Consists of 400mm condenser, 10mL receiver, 1000mL flask and mounting equipment.

**Ordering Information**

| Catalog Number | Product Description |
|---|---|
| **1402116** | Dean & Stark Moisture Test Apparatus. |



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## CERTIFIED REFERENCE REFERENCE STANDARDS

• Certified Petroleum Reference Standards.....266

## Certified Standards for ASTM Test Methods

### Certified Petroleum Reference Standards

• Manufactured and certified for ASTM and related test procedures
• NIST traceable standards developed utilizing ASTM Round Robin trials
• Custom standards available

EXPOTECH USA offers an extensive range of certified petroleum reference materials meeting the analytical requirements for ASTM, ISO, EPA, and related test methods, and are traceable to National Institute of Standards and Technology. Complete certification is provided with each standard. Refer to the list below for the reference standard that you require or contact us to discuss your needs for a special standard. Detailed datasheets and quotations for standards listed below or for specially prepared standards are readily available from EXPOTECH USA by contacting our Customer Service Department. We will respond to you promptly upon receiving your request.

| Certified Standards for Petroleum Test Methods | |
|---|---|
| — | PIANO, PONA, PNA by GC |
| — | O-PONA Method by GC |
| — | Simulated Distillation (Sim Dis) by GC |
| **D56** | Flash Point by Tag Closed Cup |
| **D86** | Synthetic Distillation Standard |
| **D92** | Flash Point by Cleveland Open Cup |
| **D93** | Flash Point by Pensky-Martens Closed Cup |
| **D97** | Pour Point |
| **D323** | Reid Vapor Pressure of Petroleum Products |
| **D445** | Kinematic Viscosity |
| **D611** | Aniline Point |
| **D613** | Cetane Number of Diesel Fuel Oil |
| **D1015** | Freezing Point |
| **D1319** | Olefin Analysis by FIA |
| **D1744** | Water in Liquid Petroleum Products |
| **D2162** | Calibration of Master Viscometers & Viscosity Oil Standards |
| **D2386** | Freezing Point |
| **D2500** | Cloud Point |
| **D2699** | RON of Spark-Ignition Engine Fuel |
| **D2700** | MON of Spark-Ignition Engine Fuel |
| **D2789** | Hydrocarbon Analysis in Gasoline by GC/MS |
| **D2887** | Boiling Range by GC |
| **D3230** | Salts in Crude Oil |
| **D3231** | Phosphorus in Gasoline |
| **D3237** | Lead in Gasoline by AA |
| **D3242** | Acidity in Aviation Turbine Fuel |
| **D3340** | Li and Na in Lubricating Greases by Flame Photometer |
| **D3524** | Diesel Fuel Analysis by GC |
| **D3605** | Trace Metal in Gas Turbine Fuel by AA |
| **D3606** | Aromatics in Gasoline by GC |
| **D3610** | Total Cobalt Analysis by Potentiometric Titration |
| **D3710** | Boiling Range by GC |
| **D3798** | p-Xylene Analysis by GC |
| **D3831** | Manganese in Gasoline by AA |
| **D4052** | Density, Relative, and API Gravity of Liquids |
| **D4053** | Benzene in Motor and Aviation Gasoline |
| **D4059** | PCB Analysis by GC |
| **D4110** | Ion Chromatography |
| **D4291** | Ethylene Glycol by GC |

| Certified Standards for Petroleum Test Methods (cont'd) | |
|---|---|
| **D4327** | Ion Chromatography |
| **D4377** | Water in Liquid Petroleum Products |
| **D4420** | Aromatics in Gasoline by GC |
| **D4628** | Wear Metals in Lube Oil |
| **D4629** | Nitrogen by Chemilluminescence |
| **D4815** | Oxygenates in Gasoline by GC |
| **D4927** | Wear Metals and Additives by WD-XRF |
| **D4928** | Water in Liquid Petroleum Products |
| **D4929** | Chlorine in Crude Oil by Microcoulometry |
| **D4951** | Wear Metals and Additives by ICP |
| **D4953** | Vapor Pressure of Gasoline |
| **D5056** | Trace Metals in Petroleum Coke by AA |
| **D5059** | Lead in Gasoline by X-Ray Spectroscopy |
| **D5184** | Al and Si by ICP |
| **D5186** | Aromatics by SFC |
| **D5188** | Vapor-Liquid Ratio Temperature |
| **D5191** | Vapor Pressure Standards |
| **D5307** | Boiling Range Distribution by GC |
| **D5441** | MTBE Analysis by GC |
| **D5442** | Petroleum Waxes by GC |
| **D5443** | PNA Analysis by Multidimensional GC |
| **D5480** | Oil Volatility by GC |
| **D5482** | Vapor Pressure Standards |
| **D5501** | Ethanol Analysis by GC |
| **D5580** | Aromatics by GC |
| **D5599** | Oxygenates by OFID |
| **D5600** | Trace Metals by ICP |
| **D5622** | Oxygenates by Reductive Pyrolysis |
| **D5623** | Sulfur Compounds by Sulfur Selective Detection |
| **D5708** | Trace Metals by ICP |
| **D5762** | Nitrogen by Chemilluminescence |
| **D5769** | Aromatics by GC/MS |
| **D5771** | Cloud Point (Stepped Cooling Method) |
| **D5772** | Cloud Point (Linear Cooling Rate) |
| **D5773** | Cloud Point (Constant Cooling Rate) |
| **D5863** | Trace Metals by AA |
| **D5901** | Freezing Point (Auto Optical Method) |
| D5949 | Pour Point (Auto Pressure Pulsing Method) |
| D5950 | Pour Point (Auto Tilt Method) |



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| Certified Standards for Petroleum Test Methods (cont'd) | |
|---|---|
| **D5972** | Freezing Point |
| **D5985** | Pour Point (Rotational Method) |
| **D5986** | Oxygenates and Aromatics by GC/FTIR |
| **D6160** | PCBs by GC |
| **D6258** | Solvent Red 164 Dye Concentration in Diesel Fuels |
| **D6277** | Benzene in Spark Ignition Fuels |
| **D6293** | Oxygenates in Engine Fuels by GC |
| **D6296** | Total Olefins in Spark Ignition Engine Fuels by GC |
| **D6304** | Water in Liquid Petroleum Products |
| **D6352** | Boiling Range Distribution of Petroleum |
| **D6371** | Cold Filter Plugging Point of Diesel and Heating Fuels |
| **D6378** | Vapor Pressure |
| **D6379** | Aromatic Hydrocarbon by HPLC |
| **D6417** | Engine Oil by GC |
| **D6443** | Metals in Oil |
| **D6481** | Lube Oils by ED-XRF |
| **D6550** | Olefin Content of Gasoline by SFC |
| **IP170** | Flash Point by Abel Closed Cup |
| **Sulfur Standards** | |
| **D2622** | Sulfur by WD-XRF |
| **D3120** | Sulfur by Oxidative Microcoulometry |
| **D3246** | Sulfur in Petroleum Gas by Oxidative Microcoulometry |
| **D4294** | Sulfur by ED-XRF |
| **D5453** | Sulfur by Ultraviolet Fluorescence |
| **D6334** | Sulfur in Gasoline by Wavelength |
| **D6445** | Sulfur in Gasoline by ED-XRF |



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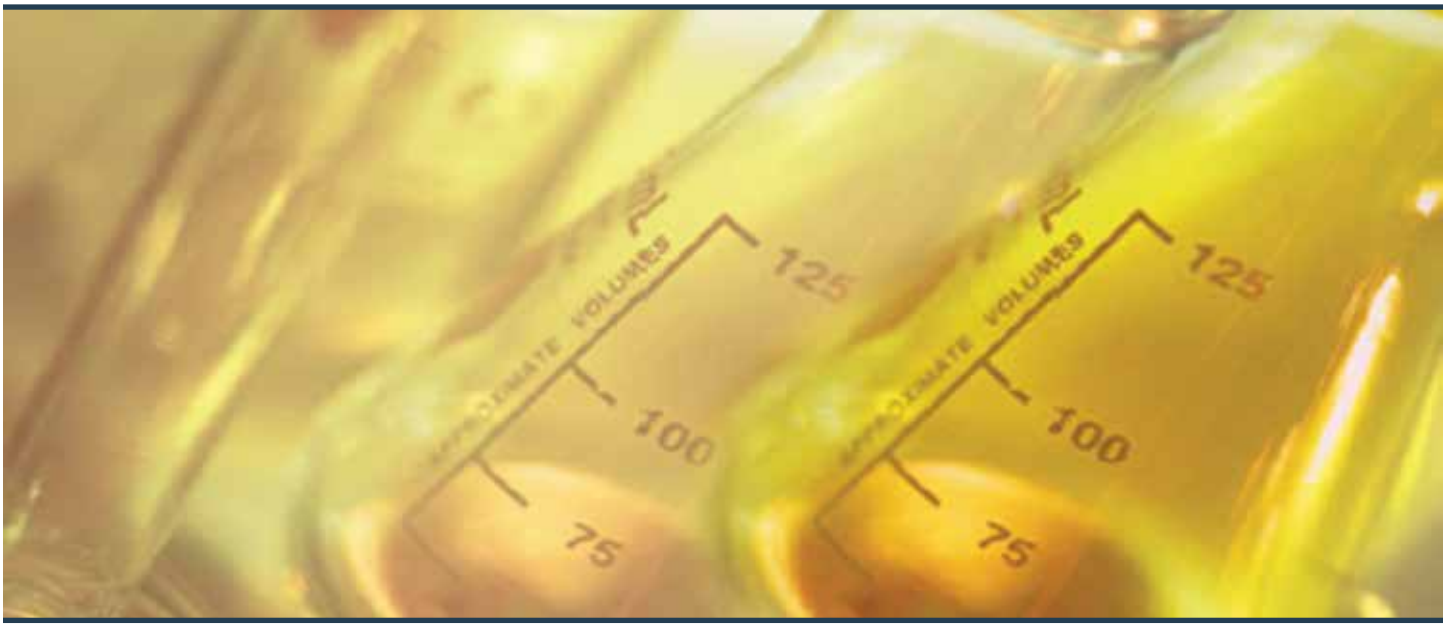
# ASTM THERMOMETERS

• ASTM Thermometers.....268



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| Catalog Number | ASTM Designation | IP Ref: | Name | Range |
|---|---|---|---|---|
| **2035891** | 1C | — | Partial Immersion | –20 to +150°C |
| **2037970** | 1C | — | 1C CERTIFIED @ ASTM specified test points of –20, 0, +50, 100, 150°C | |
| **2036590** | 1F | — | Partial Immersion | 0 to 302°F |
| **2037504** | 1F | — | 1F CERTIFIED @ ASTM specified test points of 0, 32, 122, 212, 302°F | |
| **2037132** | 2C | 62C | Partial Immersion | –5 to +300°C |
| **2038028** | 2C | 62C | 2C CERTIFIED @ ASTM specified test points of 0, 75, 150, 225, 300°C | |
| **2037199** | 2F | 62F | Partial Immersion | 20 to 580°F |
| **2035330** | 2F | 62F | 2F CERTIFIED @ ASTM specified test points of 32, 150, 300, 450, 580°F | |
| **2036325** | 3C | 73C | Partial Immersion | –5 to +400°C |
| **2038292** | 3C | 73C | 3C CERTIFIED @ ASTM specified test points of 0, 100, 200, 300, 370°C | |
| **2037303** | 3F | 73F | Partial Immersion | 20 to 760°F |
| **2037294** | 3F | 73F | 3F CERTIFIED @ ASTM specified test points of 32, 200, 370, 540, 700°F | |
| **2038128** | 4C | — | Acid Heat | –1 to +105°C |
| **2037343** | 4C | — | 4C CERTIFIED @ ASTM specified test points of 0, 50, 100°C | |
| **2037728** | 4F | — | Acid Heat | 30 to 220°F |
| **2035716** | 4F | — | 4F CERTIFIED @ ASTM specified test points of 32, 122, 212°F | |
| **1793022** | 5C | 1C | Cloud & Pour, High | –38 to +50°C |
| **2037623** | 5C | 1C | 5C CERTIFIED @ ASTM specified test points of –35, 0, +50°C | |
| **2035158** | 5F | 1F | Cloud & Pour, High | –36 to +120°F |
| **2035430** | 5F | 1F | 5F CERTIFIED @ ASTM specified test points of –30, +32, 120°F | |
| **1872569** | 6C | 2C | Cloud & Pour, Low | –80 to +20°C |
| **2036864** | 6C | 2C | 6C CERTIFIED @ ASTM specified test points of –70, –35, 0, +20°C | |
| **2036022** | 6F | 2F | Cloud & Pour, Low | –112 to +70°F |
| **2036655** | 6F | 2F | 6F CERTIFIED @ ASTM specified test points of –94, –30, +32, 70°F | |
| **2037416** | 7C | 5C | Distillation, Low | –2 to +300°C |
| **1455785** | 7C | 5C | 7C CERTIFIED @ ASTM specified test points of 0, 50, 100, 150, 200, 250, 300°C | |
| **2037206** | 7F | — | Distillation, Low | 30 to 580°F |
| **2036924** | 7F | — | 7F CERTIFIED @ ASTM specified test points of 32, 100, 200, 300, 400, 500, 570°F | |
| **1394587** | 8C | 6C | Distillation, High | –2 to +400°C |
| **1455778** | 8C | 6C | 8C CERTIFIED @ ASTM specified test points of 0, 100, 200, 300, 370°C | |
| **2037009** | 8F | — | Distillation, High | 30 to 760°F |
| **2036220** | 8F | — | 8F CERTIFIED @ ASTM specified test points of 32, 200, 370, 540, 700°F | |
| **2036580** | 9C | 15C | Pensky-Martens, Low | –5 to +110°C |
| **2036582** | 9C | 15C | 9C CERTIFIED @ ASTM specified test points of 0, 35, 70, 105°C | |
| **1793619** | 9F | 15F | Pensky-Martens, Low | 20 to 230°F |
| **2037915** | 9F | 15F | 9F CERTIFIED @ ASTM specified test points of 32, 100, 160, 220°F | |



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| Catalog Number | ASTM Designation | IP Ref: | Name | Range |
|---|---|---|---|---|
| **2019651** | 10C | 16C | Pensky-Martens, High | 90 to 370°C |
| **2035409** | 10C | 16C | 10C CERTIFIED @ ASTM specified test points of 100, 200, 300, 370C | |
| **1793620** | 10F | 16F | Pensky-Martens, High | 200 to 700°F |
| **2035939** | 10F | 16F | 10F CERTIFIED @ ASTM specified test points of 212, 390, 570, 700F | |
| **1795618** | 11C | 28C | Open Flash | –6 to +400°C |
| **2037461** | 11C | 28C | 11C CERTIFIED @ ASTM specified test points of 0, 100, 200, 300, 370°C | |
| **2037667** | 11F | 28F | Open Flash | 20 to 760°F |
| **2036472** | 11F | 28F | 11F CERTIFIED @ ASTM specified test points of 32, 200, 370, 540, 700°F | |
| **1793023** | 12C | 64C | Gravity (Density) | –20 to +102°C |
| **2036146** | 12C | 64C | 12C CERTIFIED @ ASTM specified test points of –20, –10, 0, +10, 20, 30, 40, 50, 60, 70, 80, 90, 100°C | |
| **2037926** | 12F | 64F | Gravity (Density) | –5 to +215°F |
| **2036854** | 12F | 64F | 12F CERTIFIED @ ASTM specified test points of –5, 15, 32, 60, 85, 110, 135, 160, 185, 210°F | |
| **2035551** | 13C | 47C | Loss on Heat | 155 to 170°C° |
| **2036524** | 13C | 47C | 13C CERTIFIED @ ASTM specified test points of 155, 163, 170°C | |
| **2036160** | 14C | 17C | Paraffin Wax Melting Point | 38 to 82°C |
| **2036093** | 14C | 17C | 14C CERTIFIED @ ASTM specified test points of 40, 50, 60, 70, 80°C | |
| **2035984** | 14F | 17F | Paraffin Wax Melting Point | 100 to 180°F |
| **2036746** | 14F | 17F | 14F CERTIFIED @ ASTM specified test points of 100, 120, 140, 160, 180°F | |
| **2036911** | 15C | 60C | Softening Point, Low | –2 to +80°C |
| **2035942** | 15C | 60C | 15C CERTIFIED @ ASTM specified test points of 0, 20, 40, 60, 80°C | |
| **2036433** | 15F | — | Softening Point, Low | 30 to 180°F |
| **2037014** | 15F | — | 15F CERTIFIED @ ASTM specified test points of 32, 70, 100, 140, 180°F | |
| **2036464** | 16C | 61C | Softening Point, High | 30 to 200°C |
| **2037491** | 16C | 61C | 16C CERTIFIED @ ASTM specified test points of 30, 60, 90, 120, 150, 180, 200°C | |
| **2036992** | 16F | — | Softening Point, High | 85 to 392°F |
| **2037147** | 16F | — | 16F CERTIFIED @ ASTM specified test points of 90, 140, 190, 240, 290, 340, 390°F | |
| **2035696** | 17C | — | Saybolt Viscosity | 19 to 27°C |
| **2035867** | 17C | — | 17C CERTIFIED @ ASTM specified test points of 21, 25°C | |
| **2035906** | 17F | — | Saybolt Viscosity | 66 to 80°F |
| **2037579** | 17F | — | 17F CERTIFIED @ ASTM specified test points of 70, 77°F | |
| **1872714** | 18C | 23C | Saybolt Viscosity & Reid Vapor | 34 to 42°C |
| **2038001** | 18C | 23C | 18C CERTIFIED @ ASTM specified test points of 38, 41°C | |
| **2037974** | 18F | 23F | Saybolt Viscosity & Reid Vapor | 94 to 108°F |
| **2035156** | 18F | 23F | 18F CERTIFIED @ ASTM specified test points of 100, 107°F | |



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| Catalog Number | ASTM Designation | IP Ref: | Name | Range |
|---|---|---|---|---|
| **2035733** | 19C | — | Saybolt Viscosity | 49 to 57°C |
| **2038242** | 19C | — | 19C CERTIFIED @ ASTM specified test points of 50, 54°C | |
| **2035664** | 19F | — | Saybolt Viscosity | 120 to 134°F |
| **2037097** | 19F | — | 19F CERTIFIED @ ASTM specified test points of 122, 130°F | |
| **2035795** | 20C | — | Saybolt Viscosity | 57 to 65°C |
| **2036543** | 20C | — | 20C CERTIFIED @ ASTM specified test points of 60, 64°C | |
| **2035863** | 20F | — | Saybolt Viscosity | 134 to 148°F |
| **2035046** | 20F | — | 20F CERTIFIED @ ASTM specified test points of 140, 147°F | |
| **2036032** | 21C | — | Saybolt Viscosity | 79 to 87°C |
| **2036942** | 21C | — | 21C CERTIFIED @ ASTM specified test points of 82, 86°C | |
| **2035978** | 21F | — | Saybolt Viscosity | 174 to 188°F |
| **2035870** | 21F | — | 21F CERTIFIED @ ASTM specified test points of 180, 187°F | |
| **1394491** | 22C | 24C | Saybolt Viscosity & Oxidation Stability | 95 to 103°C |
| **2037051** | 22C | 24C | 22C CERTIFIED @ ASTM specified test points of 99, 102°C | |
| **1394492** | 22F | 24F | Saybolt Viscosity & Oxidation Stability | 204 to 218°F |
| **2038268** | 22F | 24F | 22F CERTIFIED @ ASTM specified test points of 210, 212°F | |
| **2037908** | 23C | — | Viscosity Engler | 18 to 28°C |
| **2036302** | 23C | — | 23C CERTIFIED @ ASTM specified test points of 20, 25°C | |
| **2035455** | 24C | — | Viscosity Engler | 39 to 54°C |
| **2035228** | 24C | — | 24C CERTIFIED @ ASTM specified test points of 40, 50°C | |
| **2035950** | 25C | — | Viscosity Engler | 95 to 105°C |
| **2037249** | 25C | — | 25C CERTIFIED @ ASTM specified test points of 95, 100°C | |
| **2035139** | 26C | — | Stability Test of Soluble Nitro-Cellulose | 130 to 140°C |
| **2038192** | 26C | — | 26C CERTIFIED @ ASTM specified test points of 130, 135, 140°C | |
| **2037376** | 27C | — | Turpentine Distillation | 147 to 182°C |
| **2037299** | 27C | — | 27C CERTIFIED @ ASTM specified test points of 155, 165, 175°C | |
| **2037765** | 28C | 31C | Kinematic Viscosity @ 37.8C | 36.6 to 39.4°C |
| **2036203** | 28C | 31C | 28C CERTIFIED @ ASTM specified test points of 0, 37.8, 39°C | |
| **2037469** | 28F | — | Kinematic Viscosity @ 100F | 97.5 to 102.5°F |
| **2036752** | 28F | — | 28F CERTIFIED @ ASTM specified test points of 32, 100, 102°F | |
| **2037878** | 29C | 34C | Kinematic Viscosity @ 54.4C | 52.6 to 55.4°C |
| **2037742** | 29C | 34C | 29C CERTIFIED @ ASTM specified test points of 0, 54.4, 55°C | |
| **2037790** | 29F | — | Kinematic Viscosity @ 130F | 127.5 to 132.5°F |
| **2037010** | 29F | — | 29F CERTIFIED @ ASTM specified test points of 32, 130, 132°F | |
| **2038046** | 30F | 32F | Kinematic Viscosity @ 210F | 207.5 to 212.5°F |
| **2037780** | 30F | 32F | 30F CERTIFIED @ ASTM specified test points of 32, 210, 212°F | |

| Catalog Number | ASTM Designation | IP Ref: | Name | Range |
|---|---|---|---|---|
| **2035251** | 31F | — | Reid Vapor | –30 to +120°F |
| **2038211** | 31F | — | 31F CERTIFIED @ ASTM specified test points of –20, +32, 100°F | |
| **1797870** | 33C | 20C | Aniline Point | –38 to +42°C |
| **2035286** | 33C | 20C | 33C CERTIFIED @ ASTM specified test points of –35, –20, 0, +20, 40°C | |
| **1797869** | 33F | — | Aniline Point | –36.5 to +107.5°F |
| **2038044** | 33F | — | 33F CERTIFIED @ ASTM specified test points of –31, –4, +32, 68, 104°F | |
| **1797872** | 34C | 21C | Aniline Point | 25 to 105°C |
| **2036875** | 34C | 21C | 34C CERTIFIED @ ASTM specified test points of 25, 45, 65, 85, 100°C | |
| **1797871** | 34F | — | Aniline Point | 77 to 221°F |
| **2035990** | 34F | — | 34F CERTIFIED @ ASTM specified test points of 77, 113, 149, 185, 212°F | |
| **1797873** | 35C | 59C | Aniline Point | 90 to 170°C |
| **2035662** | 35C | 59C | 35C CERTIFIED @ ASTM specified test points of 100, 120, 140, 160, 170°C | |
| **1797874** | 35F | — | Aniline Point | 194 to 338°F |
| **2036198** | 35F | — | 35F CERTIFIED @ ASTM specified test points of 212, 250, 285, 320, 338°F | |
| **2036628** | 36C | — | Titer Test | –2 to +68°C |
| **2036335** | 36C | — | 36C CERTIFIED @ ASTM specified test points of 0, 15, 30, 45, 65°C | |
| **2038115** | 37C | 77C | Solvents Distillation | –2 to +52°C |
| **2036950** | 37C | 77C | 37C CERTIFIED @ ASTM specified test points of 0, 15, 30, 50°C | |
| **2036103** | 38C | 78C | Solvents Distillation | 24 to 78°C |
| **2035784** | 38C | 78C | 38C CERTIFIED @ ASTM specified test points of 25, 40, 55, 75C | |
| **2036338** | 39C | 79C | Solvents Distillation | 48 to 102°C |
| **2036130** | 39C | 79C | 39C CERTIFIED @ ASTM specified test points of 50, 65, 80, 100°C | |
| **2036812** | 40C | 80C | Solvents Distillation | 72 to 126°C |
| **2036372** | 40C 80C | 40C | CERTIFIED @ ASTM specified test points of 75, 90, 105, 125°C | |
| **2035054** | 41C | 81C | Solvents Distillation | 98 to 152°C |
| **2036555** | 41C | 81C | 41C CERTIFIED @ ASTM specified test points of 100, 115, 130, 150°C | |
| **2035955** | 42C | 82C | Solvents Distillation | 95 to 255°C |
| **2036111** | 42C | 82C | 42C CERTIFIED @ ASTM specified test points of 100, 150, 200, 250°C | |
| **2036074** | 43C | 65C | Kinematic Viscosity | –51.6 to –34°C |
| **2036673** | 43C | 65C | 43C CERTIFIED @ ASTM specified test points of –50, –45, –40, –35, 0°C | |
| **2036714** | 43F | 65F | Kinematic Viscosity | –61 to –29°F |
| **2035099** | 43F | 65F | 43F CERTIFIED @ ASTM specified test points of –60, –50, –40, –30, +32°F | |
| **2036292** | 44C | 29C | Kinematic Viscosity @ 20C | 18.5 to 21.5°C |
| **2037606** | 44C | 29C | 44C CERTIFIED @ ASTM specified test points of 0, 20, 21°C | |

| Catalog Number | ASTM Designation | IP Ref: | Name | Range |
|---|---|---|---|---|
| **2035574** | 44F | 29F | Kinematic Viscosity @ 68F | 66.5 to 71.5°F |
| **2035586** | 44F | 29F | 44F CERTIFIED @ ASTM specified test points of 32, 68, 70°F | |
| **2035738** | 45C | 30C | Kinematic Viscosity @ 25C | 23.6 to 26.4°C |
| **2035273** | 45C | 30C | 45C CERTIFIED @ ASTM specified test points of 0, 25, 26°C | |
| **2036344** | 45F | 30F | Kinematic Viscosity @ 77F | 74.5 to 79.5°F |
| **2037451** | 45F | 30F | 45F CERTIFIED @ ASTM specified test points of 32, 77, 79°F | |
| **2038105** | 46C | 66C | Kinematic Viscosity @ 50C | 48.6 to 51.4°C |
| **2037628** | 46C | 66C | 46C CERTIFIED @ ASTM specified test points of 0, 50, 51°C | |
| **2037301** | 46F | 66F | Kinematic Viscosity @ 122F | 119.5 to 124.5°F |
| **2035196** | 46F | 66F | 46F CERTIFIED @ ASTM specified test points of 32, 122, 124°F | |
| **2035463** | 47C | 35C | Kinematic Viscosity @ 60C | 58.6 to 61.4°C |
| **2035084** | 47C | 35C | 47C CERTIFIED @ ASTM specified test points of 0, 60, 61°C | |
| **2037367** | 47F | 35F | Kinematic Viscosity @ 140F | 137.5 to 142.5°F |
| **2037125** | 47F | 35F | 47F CERTIFIED @ ASTM specified test points of 32, 140, 142°F | |
| **2037680** | 48C | 90C | Kinematic Viscosity @ 82.2C | 80.6 to 83.4°C |
| **2035588** | 48C | 90C | 48C CERTIFIED @ ASTM specified test points of 0, 82.2, 83°C | |
| **2038085** | 48F | 90F | Kinematic Viscosity @ 180F | 177.5 to 182.5°F |
| **2036937** | 48F | 90F | 48F CERTIFIED @ ASTM specified test points of 32, 180, 182°F | |
| **2038014** | 49C | — | Stormer Viscosity | 20 to 70°C |
| **2037188** | 49C | — | 49C CERTIFIED @ ASTM specified test points of 20, 35, 50, 70°C | |
| **2037528** | 50F | — | Gas Calorimeter Inlet 54 to 101°F | |
| **2037808** | 50F | — | 50F CERTIFIED @ ASTM specified test points of 55, 60, 65, 70, 75, 80, 85, 90, 95, 100°F | |
| **2036990** | 51F | — | Gas Calorimeter Outlet | 69 to 116°F |
| **2037650** | 51F | — | 51F CERTIFIED @ ASTM specified test points of 70, 75, 80, 85, 90, 95, 100, 105, 110, 115°F | |
| **2035162** | 52C | — | Butadiene Boiling Point | –10 to +5°C |
| **2035147** | 52C | — | 52C CERTIFIED @ ASTM specified test points of –10, 0, +5°C | |
| **2035602** | 53C | — | Benzene Freezing Pt | –0.6 to +10.4°C |
| **2037160** | 53C | — | 53C CERTIFIED @ ASTM specified test points of 0, 5, 10°C | |
| **2038248** | 54C | 18C | Congealing Point | 20 to 100.6°C |
| **2036821** | 54C | 18C | 54C CERTIFIED @ ASTM specified test points of 20, 50, 75, 100°C | |
| **2037778** | 54F | 18F | Congealing Point | 68 to 213°F |
| **2036420** | 54F | 18F | 54F CERTIFIED @ ASTM specified test points of 70, 120, 170, 210°F | |
| **2037841** | 56C | — | Bomb Calorimeter | 19 to 35°C |
| **2036025** | 56C | — | 56C CERTIFIED @ ASTM specified test points of 19, 21, 23, 25, 27, 29, 31°C | |

| Catalog Number | ASTM Designation | IP Ref: | Name | Range |
|---|---|---|---|---|
| **2035433** | 56F | — | Bomb Calorimeter | 66 to 95°F |
| **2036901** | 56F | — | 56F CERTIFIED @ ASTM specified test points of 66, 70, 74, 78, 82, 88, 92, 95°F | |
| **1795194** | 57C | — | Tag Closed Tester Low Range | –20 to +50°C |
| **2036564** | 57C | — | 57C CERTIFIED @ ASTM specified test points of –20, 0, 25, +50°C | |
| **1795193** | 57F | — | Tag Closed Tester Low Range | –4 to +122°F |
| **2035443** | 57F | — | 57F CERTIFIED @ ASTM specified test points of –3, +32, 77, 122°F | |
| **2035834** | 58C | — | Tank Gauging | –34 to +49°C |
| **2036137** | 58C | — | 58C CERTIFIED @ ASTM specified test points of –30, 0, +25, 45°C | |
| **2036247** | 58F | — | Tank Gauging | –30 to +120°F |
| **2036267** | 58F | — | 58F CERTIFIED @ ASTM specified test points of –20, +32, 80, 120°F | |
| **2036215** | 59C | — | Tank Gauging | –18 to +82°C |
| **2035783** | 59C | — | 59C CERTIFIED @ ASTM specified test points of 0, 25, 55, 80°C | |
| **2036703** | 59F | — | Tank Gauging | 0 to 180°F |
| **2036838** | 59F | — | 59F CERTIFIED @ ASTM specified test points of 32, 80, 130, 180°F | |
| **2035132** | 60C | — | Tank Gauging | 77 to 260°C |
| **2035902** | 60C | — | 60C CERTIFIED @ ASTM specified test points of 100, 175, 255°C | |
| **2037114** | 60F | — | Tank Gauging | 170 to 500°F |
| **2036138** | 60F | — | 60F CERTIFIED @ ASTM specified test points of 212, 350, 490°F | |
| **2037170** | 61C | 63C | Petrolatum Melting Point | 32 to 127°C |
| **2037390** | 61C | 63C | 61C CERTIFIED @ ASTM specified test points of 40, 60, 80, 100, 120°C | |
| **2037644** | 61F | — | Petrolatum Melting Point | 90 to 260°F |
| **2036367** | 61F | — | 61F CERTIFIED @ ASTM specified test points of 100, 150, 200, 250°F | |
| **2038040** | 62C | — | Reference Standard | –38 to +2°C |
| **2036616** | 62C | — | 62C CERTIFIED @ ASTM specified test points of –37, –30, –20, –10, 0°C | |
| **2035457** | 62F | — | Reference Standard | –36 to +35°F |
| **2035595** | 62F | — | 62F CERTIFIED @ ASTM specified test points of –35, –15, 0, +15, 32°F | |
| **2035138** | 63C | — | Reference Standard | –8 to +32°C |
| **2036997** | 63C | — | 63C CERTIFIED @ ASTM specified test points of –7, 0, +10, 20, 30°C | |
| **2037140** | 63F | — | Reference Standard | 18 to 89°F |
| **2036068** | 63F | — | 63F CERTIFIED @ ASTM specified test points of 20, 32, 50, 70, 88°F | |
| **2036538** | 64C | — | Reference Standard | 25 to 55°C |
| **2036412** | 64C | — | 64C CERTIFIED @ ASTM specified test points of 0, 25, 35, 45, 55°C | |
| **2035819** | 64F | — | Reference Standard | 77 to 131°F |
| **2036972** | 64F | — | 64F CERTIFIED @ ASTM specified test points of 32, 80, 95, 115, 130°F | |
| **2036809** | 65C | — | Reference Standard | 50 to 80°C |
| **2036784** | 65C | — | 65C CERTIFIED @ ASTM specified test points of 0, 50, 60, 70, 80°C | |

| Catalog Number | ASTM Designation | IP Ref: | Name | Range |
|---|---|---|---|---|
| **2036515** | 65F | — | Reference Standard | 122 to 176°F |
| **2036266** | 65F | — | 65F CERTIFIED @ ASTM specified test points of 32, 125, 145, 160, 175°F | |
| **2036196** | 66C | — | Reference Standard | 75 to 105°C |
| **2035173** | 66C | — | 66C CERTIFIED @ ASTM specified test points of 0, 75, 85, 95, 105°C | |
| **2036488** | 66F | — | Reference Standard | 167 to 221°F |
| **2037858** | 66F | — | 66F CERTIFIED @ ASTM specified test points of 32, 168, 185, 200, 220°F | |
| **2036444** | 67C | — | Reference Standard | 95 to 155°C |
| **2035857** | 67C | — | 67C CERTIFIED @ ASTM specified test points of 0, 100, 110, 130, 150°C | |
| **2036999** | 67F | — | Reference Standard | 203 to 311°F |
| **2037893** | 67F | — | 67F CERTIFIED @ ASTM specified test points of 32, 205, 240, 275, 310°F | |
| **2036762** | 68C | — | Reference Standard | 145 to 205°C |
| **2035262** | 68C | — | 68C CERTIFIED @ ASTM specified test points of 0, 150, 170, 190, 205°C | |
| **2037291** | 68F | — | Reference Standard | 293 to 401°F |
| **2037430** | 68F | — | 68F CERTIFIED @ ASTM specified test points of 32, 300, 340, 370, 400°F | |
| **2035462** | 69C | — | Reference Standard | 195 to 305°C |
| **2037111** | 69C | — | 69C CERTIFIED @ ASTM specified test points of 0, 200, 235, 270, 305°C | |
| **2036112** | 69F | — | Reference Standard | 383 to 581°F |
| **2037621** | 69F | — | 69F CERTIFIED @ ASTM specified test points of 32, 400, 460, 520, 580°F | |
| **2037018** | 70C | — | Reference Standard | 295 to 405°C |
| **2037000** | 70C | — | 70C CERTIFIED @ ASTM specified test points of 0, 300, 335, 370, 400°C | |
| **2035892** | 70F | — | Reference Standard | 563 to 761°F |
| **2035332** | 70F | — | 70F CERTIFIED @ ASTM specified test points of 32, 570, 640, 700, 760°F | |
| **2036987** | 71C | 72C | Oil in Wax | –37 to +21°C |
| **2035797** | 71C | 72C | 71C CERTIFIED @ ASTM specified test points of –35, –18, 0, +20°C | |
| **2035992** | 71F | 72F | Oil in Wax | –35 to +70°F |
| **2035976** | 71F | 72F | 71F CERTIFIED @ ASTM specified test points of –30, 0, +32, 70°F | |
| **2036023** | 72C | 67C | Kinematic Viscosity @ –17.8C | –19.4 to –16.6°C |
| **2035198** | 72C | 67C | 72C CERTIFIED @ ASTM specified test points of –19, –17.8, 0°C | |
| **2036550** | 72F | 67F | Kinematic Viscosity @ 0F | –2.5 to +2.5°F |
| **2037166** | 72F | 67F | 72F CERTIFIED @ ASTM specified test points of –2, 0, +32°F | |
| **2036626** | 73C | 68C | Kinematic Viscosity @ –40C | –41.4 to –38.6°C |
| **2036391** | 73C | 68C | 73C CERTIFIED @ ASTM specified test points of –41, –40, 0°C | |
| **2037932** | 73F | 68F | Kinematic Viscosity @ –40F | –42.5 to –37.5°F |
| **2035149** | 73F | 68F | 73F CERTIFIED @ ASTM specified test points of –42, –40, +32°F | |
| **2036362** | 74C | 69C | Kinematic Viscosity @ –53.9C | –55.4 to –52.6°C |
| **2037081** | 74C | 69C | 74C CERTIFIED @ ASTM specified test points of –55, –53.9, 0°C | |
| **2038096** | 74F | 69F | Kinematic Viscosity @ –65F | –67.5 to –62.5°F |
| **2037669** | 74F | 69F | 74F CERTIFIED @ ASTM specified test points of –67, –65, +32°F | |

| Catalog Number | ASTM Designation | IP Ref: | Name | Range |
|---|---|---|---|---|
| **2037313** | 75F | — | Coolant Freezing Point | –35 to +35°F |
| **2035227** | 75F | — | 75F CERTIFIED @ ASTM specified test points of –35, 0, +32°F | |
| **2035534** | 76F | — | Coolant Freezing Point | –65 to +5°F |
| **2036221** | 76F | — | 76F CERTIFIED @ ASTM specified test points of –65, –30, +32°F | |
| **2037378** | 77F | — | Saybolt Viscosity | 245 to 265°F |
| **2037840** | 77F | — | 77F CERTIFIED @ ASTM specified test points of 250, 260°F | |
| **2035077** | 78F | — | Saybolt Viscosity | 295 to 315°F |
| **2035849** | 78F | — | 78F CERTIFIED @ ASTM specified test points of 300, 310°F | |
| **2035569** | 79F | — | Saybolt Viscosity | 345 to 365°F |
| **2035864** | 79F | — | 79F CERTIFIED @ ASTM specified test points of 350, 360°F | |
| **2038185** | 80F | — | Saybolt Viscosity | 395 to 415°F |
| **2038141** | 80F | — | 80F CERTIFIED @ ASTM specified test points of 400, 410°F | |
| **2035163** | 81F | — | Saybolt Viscosity | 445 to 465°F |
| **2038182** | 81F | — | 81F CERTIFIED @ ASTM specified test points of 450, 460°F | |
| **2037470** | 82C | — | Fuel Rating, Engine | –15 to +105°C |
| **2037090** | 82C | — | 82C CERTIFIED @ ASTM specified test points of 0, 50, 100°C | |
| **2037128** | 82F | — | Fuel Rating, Engine | 0 to 220°F |
| **2035477** | 82F | — | 82F CERTIFIED @ ASTM specified test points of 32, 100, 200°F | |
| **2037089** | 83C | — | Fuel Rating, Air | 15 to 70°C |
| **2038209** | 83C | — | 83C CERTIFIED @ ASTM specified test points of 25, 70°C | |
| **2037538** | 83F | — | Fuel Rating, Air | 60 to 160°F |
| **2035501** | 83F | — | 83F CERTIFIED @ ASTM specified test points of 85, 135°F | |
| **2037077** | 84C | — | Fuel Rating, Orifice | 25 to 80°C |
| **2036706** | 84C | — | 84C CERTIFIED @ ASTM specified test points of 30, 80°C | |
| **2037419** | 84F | — | Fuel Rating, Orifice | 75 to 175°F |
| **2036443** | 84F | — | 84F CERTIFIED @ ASTM specified test points of 100, 150°F | |
| **2037357** | 85C | — | Fuel Rating, Surge | 40 to 150°C |
| **2035732** | 85C | — | 85C CERTIFIED @ ASTM specified test points of 50, 150°C | |
| **2038117** | 85F | — | Fuel Rating, Surge | 100 to 300°F |
| **2036273** | 85F | — | 85F CERTIFIED @ ASTM specified test points of 150, 250°F | |
| **2036648** | 86C | — | Fuel Rating, Mix | 95 to 175°C |
| **2036857** | 86C | — | 86C CERTIFIED @ ASTM specified test points of 100, 175°C | |
| **2035629** | 86F | — | 86F CERTIFIED @ ASTM specified test points of 225, 325°F | |
| **2038138** | 87C | — | Fuel Rating, Coolant 150 to 205°C | |
| **2037020** | 87C | — | 87C CERTIFIED @ ASTM specified test points of 160, 200°C | |

| Catalog Number | ASTM Designation | IP Ref: | Name | Range |
|---|---|---|---|---|
| **2036033** | 87F | — | Fuel Rating, Coolant 300 to 400°F | |
| **2036009** | 87F | — | 87F CERTIFIED @ ASTM specified test points of 300, 400°F | |
| **1393905** | 88C | — | Vegetable Oil Flash | 10 to 200°C |
| **2036063** | 88C | — | 88C CERTIFIED @ ASTM specified test points of 40, 100, 150, 200°C | |
| **2036397** | 88F | — | Vegetable Oil Flash | 50 to 392°F |
| **2037420** | 88F | — | 88F CERTIFIED @ ASTM specified test points of 110, 212, 300, 392°F | |
| **2036569** | 89C | — | Solidification Point | –20 to +10°C |
| **2036498** | 89C | — | 89C CERTIFIED @ ASTM specified test points of –20, –10, 0, +10°C | |
| **2035240** | 90C | — | Solidification Point | 0 to 30°C |
| **2036758** | 90C | — | 90C CERTIFIED @ ASTM specified test points of 0, 10, 20, 30°C | |
| **2037344** | 91C | — | Solidification Point | 20 to 50°C |
| **2036494** | 91C | — | 91C CERTIFIED @ ASTM specified test points of 20, 30, 40, 50°C | |
| **2036110** | 92C | — | Solidification Point | 40 to 70°C |
| **2035406** | 92C | — | 92C CERTIFIED @ ASTM specified test points of 40, 50, 60, 70°C | |
| **2038132** | 93C | — | Solidification Point | 60 to 90°C |
| **2036371** | 93C | — | 93C CERTIFIED @ ASTM specified test points of 60, 70, 80, 90°C | |
| **2036656** | 94C | — | Solidification Point | 80 to 110°C |
| **2036800** | 94C | — | 94C CERTIFIED @ ASTM specified test points of 80, 90, 100, 110°C | |
| **2035753** | 95C | — | Solidification Point | 100 to 130°C |
| **2036704** | 95C | — | 95C CERTIFIED @ ASTM specified test points of 100, 110, 120, 130°C | |
| **1872666** | 96C | — | Solidification Point | 120 to 150°C |
| **2037484** | 96C | — | 96C CERTIFIED @ ASTM specified test points of 120, 130, 140, 150°C | |
| **2036435** | 97C | — | Tank Gauging | –18 to +49°C |
| **2037613** | 97C | — | 97C CERTIFIED @ ASTM specified test points of –15, 0, +20, 45°C | |
| **2035697** | 97F | — | Tank Gauging | 0 to 120°F |
| **2038210** | 97F | — | 97F CERTIFIED @ ASTM specified test points of 0, 32, 70, 110°F | |
| **2038271** | 98C | — | Tank Gauging | 16 to 82°C |
| **2037786** | 98C | — | 98C CERTIFIED @ ASTM specified test points of 20, 40, 60, 80°C | |
| **2037122** | 98F | — | Tank Gauging | 60 to 180°F |
| **2035195** | 98F | — | 98F CERTIFIED @ ASTM specified test points of 60, 100, 140, 180°F | |
| **2036090** | 99C | — | Weathering Test | –50 to +5°C |
| **2035530** | 99C | — | 99C CERTIFIED @ ASTM specified test points of –46, –32, –18, 0°C | |
| **2037545** | 99F | — | Weathering Test | –58 to +41°F |
| **2037093** | 99F | — | 99F CERTIFIED @ ASTM specified test points of –50, –25, 0, +32°F | |



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| Catalog Number | ASTM Designation | IP Ref: | Name | Range |
|---|---|---|---|---|
| **2037005** | 100C | — | Solidification Point | 145 to 205°C |
| **2036414** | 100C | — | 100C CERTIFIED @ ASTM specified test points of 145, 165, 185, 205°C | |
| **2036192** | 101C | — | Solidification Point | 195 to 305°C |
| **2036827** | 101C | — | 101C CERTIFIED @ ASTM specified test points of 200, 250, 300°C | |
| **2035489** | 102C | 83C | Solvents Distillation | 123 to 177°C |
| **2037907** | 102C | 83C | 102C CERTIFIED @ ASTM specified test points of 125, 140, 155, 175°C | |
| **2037489** | 103C | 84C | Solvents Distillation | 148 to 202°C |
| **2035799** | 103C | 84C | 103C CERTIFIED @ ASTM specified test points of 150, 165, 180, 200°C | |
| **2036223** | 104C | 85C | Solvents Distillation | 173 to 227°C |
| **2035624** | 104C | 85C | 104C CERTIFIED @ ASTM specified test points of 175, 190, 205, 225°C | |
| **2036548** | 105C | 86C | Solvents Distillation | 198 to 252°C |
| **2036677** | 105C | 86C | 105C CERTIFIED @ ASTM specified test points of 200, 215, 230, 250°C | |
| **2036145** | 106C | 87C | Solvents Distillation | 223 to 277°C |
| **2035652** | 106C | 87C | 106C CERTIFIED @ ASTM specified test points of 225, 240, 255, 275°C | |
| **2037354** | 107C | 88C | Solvents Distillation | 248 to 302°C |
| **2035853** | 107C | 88C | 107C CERTIFIED @ ASTM specified test points of 250, 265, 280, 300°C | |
| **2035219** | 108F | — | Saybolt Viscosity | 270 to 290°F |
| **2037397** | 108F | — | 108F CERTIFIED @ ASTM specified test points of 275, 285°F | |
| **2037350** | 109F | — | Saybolt Viscosity | 320 to 340°F |
| **2038155** | 109F | — | 109F CERTIFIED @ ASTM specified test points of 325, 335°F | |
| **2035207** | 110C | 93C | Kinematic Viscosity @ 135C | 133.6 to 136.4°C |
| **2037169** | 110C | 93C | 110C CERTIFIED @ ASTM specified test points of 0, 135, 136°C | |
| **2035447** | 110F | — | Kinematic Viscosity @ 275F | 272.5 to 277.5°F |
| **2037164** | 110F | — | 110F CERTIFIED @ ASTM specified test points of 32, 275, 277°F | |
| **2036476** | 111C | — | Tar Acid Distillation | 170 to 250°C |
| **2037165** | 111C | — | 111C CERTIFIED @ ASTM specified test points of 170, 200, 250°C | |
| **2035878** | 112C | — | Solidification Benzene | 4 to 6°C |
| **2037745** | 112C | — | 112C CERTIFIED @ ASTM specified test points of 0, 4, 5, 6°C | |
| **2036749** | 113C | 89C | Bituminous Materials Softening Point | –1 to +175°C |
| **2036690** | 113C | 89C | 113C CERTIFIED @ ASTM specified test points of 0, 50, 100, 150, 175°C | |
| **2036896** | 113F | 89F | Bituminous Materials Softening Point | 30 to 350°F |
| **2035634** | 113F | 89F | 113F CERTIFIED @ ASTM specified test points of 32, 122, 212, 302, 347°F | |
| **2037197** | 114C | 14C | Aviation Fuel Freezing Point | –80 to +20°C |
| **2037031** | 114C | 14C | 114C CERTIFIED @ ASTM specified test points of –75, –60, –40, 0°C | |



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| Catalog Number | ASTM Designation | IP Ref: | Name | Range |
|---|---|---|---|---|
| **2303502** | 114F | — | Aviation Fuel Freezing Point | –112 to +70°F |
| **2037481** | 114F | — | 114F CERTIFIED @ ASTM specified test points of –103, –76, –40, +32°F | |
| **2036328** | 116C | — | Bomb Colorimeter | 18.9 to 25.1C° |
| **2037752** | 116C | — | 116C CERTIFIED @ ASTM specified test points of 19, 20, 21, 22, 23, 24, 25°C | |
| **2036619** | 117C | — | Bomb Calorimeter | 23.9 to 30.1°C |
| **2038006** | 117C | — | 117C CERTIFIED @ ASTM specified test points of 24, 25, 26, 27, 28, 29, 30°C | |
| **2035446** | 118C | — | Kinematic Viscosity @ 30C | 28.6 to 31.4°C |
| **2035690** | 118C | — | 118C CERTIFIED @ ASTM specified test points of 0, 30, 31°C | |
| **2035405** | 118F | — | Kinematic Viscosity @ 86F | 83.5 to 88.5°F |
| **2035977** | 118F | — | 118F CERTIFIED @ ASTM specified test points of 32, 86, 88°F | |
| **2036424** | 119C | — | Coolant Freezing Point | –38.3 to –30°C |
| **2035829** | 119C | — | 119C CERTIFIED @ ASTM specified test points of –38, –30, 0°C | |
| **2036521** | 119F | — | Coolant Freezing Point | –37 to –22°F |
| **2036147** | 119F | — | 119F CERTIFIED @ ASTM specified test points of –36, –22, +32°F | |
| **1394532** | 120C | 92C | Kinematic Viscosity @ 40C 3 | 8.6 to 41.4°C |
| **2036813** | 120C | 92C | 120C CERTIFIED @ ASTM specified test points of 0, 40, 41°C | |
| **1394533** | 121C | 32C | Kinematic Viscosity @ 100C | 98.6 to 101.4°C |
| **2035811** | 121C | 32C | 121C CERTIFIED @ ASTM specified test points of 0, 100, 101°C | |
| **2037411** | 122C | 94C | Brookfield Viscosity | –45 to –35°C |
| **2037042** | 122C | 94C | 122C CERTIFIED @ ASTM specified test points of –45, –40, -35°C | |
| **2037984** | 123C | 95C | Brookfield Viscosity | –35 to –25°C |
| **2035266** | 123C | 95C | 123C CERTIFIED @ ASTM specified test points of –35, –30, -25°C | |
| **2037602** | 124C | 96C | Brookfield Viscosity | –25 to –15°C |
| **2037913** | 124C | 96C | 124C CERTIFIED @ ASTM specified test points of –25, –20, –15°C | |
| **2038158** | 125C | 97C | Brookfield Viscosity | –15 to –5°C |
| **2035822** | 125C | 97C | 125C CERTIFIED @ ASTM specified test points of –15, –10, –5°C | |
| **2037566** | 126C | 71C | Kinematic Viscosity @ –26.1C | –27.4 to –24.6°C |
| **2037237** | 126C | 71C | 126C CERTIFIED @ ASTM specified test points of –27, -26.1, 0°C | |
| **2037551** | 126F | 71F | Kinematic Viscosity @ –15F | –17.5 to –12.5°F |
| **2037237** | 126F | 71F | 126F CERTIFIED @ ASTM specified test points of –17, –15, +32°F | |
| **2035248** | 127C | 99C | Kinematic Viscosity @ -20C | –21.4 to –18.6°C |
| **2037464** | 127C | 99C | 127C CERTIFIED @ ASTM specified test points of –21, –20, 0°C | |
| **2037025** | 128C | 33C | Kinematic Viscosity @ 0C | –1.4 to +1.4°C |
| **2037748** | 128C | 33C | 128C CERTIFIED @ ASTM specified test points of 0, 1°C | |

| Catalog Number | ASTM Designation | IP Ref: | Name | Range |
|---|---|---|---|---|
| **2036713** | 128F | 33F | Kinematic Viscosity @ 32F | 29.5 to 34.5°F |
| **2038154** | 128F | 33F | 128F CERTIFIED @ ASTM specified test points of 32, 34°F | |
| **2036934** | 129C | 36C | Kinematic Viscosity @ 93.3C | 91.6 to 94.4°C |
| **2035106** | 129C | 36C | 129C CERTIFIED @ ASTM specified test points of 0, 93.3, 94°C | |
| **2036496** | 129F | 36F | Kinematic Viscosity @ 200F | 197.5 to 202.5°F |
| **2037801** | 129F | 36F | 129F CERTIFIED @ ASTM specified test points of 32, 200, 202°F | |
| **2035735** | 130C | — | Tank Gauging | –7 to +105°C |
| **2035741** | 130C | — | 130C CERTIFIED @ ASTM specified test points of 0, 35, 70, 105°C | |
| **2036469** | 130F | — | Tank Gauging | 20 to 220°F |
| **2036136** | 130F | — | 130F CERTIFIED @ ASTM specified test points of 32, 100, 160, 220°F | |
| **2036109** | 132C | — | Kinematic Viscosity @ 150C | 148.6 to 151.4°C |
| **2036342** | 132C | — | 132C CERTIFIED @ ASTM specified test points of 0, 150, 151°C | |

Spare parts are generally available from stock for immediate shipment. The parts listings in this section are for customers who may wish to maintain a stock of spares at their facility for several years of operation. This may be of particular interest to overseas customers. Suggested quantities are in parentheses ( ).

Please note: The parts listed in this section are for current equipment models at the time of printing. When ordering spare parts for new equipment from this catalog, substitutions may be made by EXPOTECH USA to reflect engineering changes. EXPOTECH USA will provide written notification of any changes before processing your order. When ordering spare parts for existing equipment, please specify the model number and serial number of your equipment. This will insure that the correct parts are supplied.

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1792223 Wattstat, 115V

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2037001 Bulb (1)
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2037001 Bulb (1)
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2037687 Pyrex Pump Body (1)
2037190 Thin Film Tube (1)
2037001 Bulb (1)
2037618 Bearings (2)
2036998 Motor, Modification (1)

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2037816 Flexible Drive Shaft (1)
2037119 Powerstat (1)
2035302 Motor (1)
2037180 Indicator Light Bulb (2)
2038156 Fuse, 10A (1)
2272144 Heater Coil (1)
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2037119 Powerstat (1)
2035302 Motor (1)
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2038018 Fuse, 0.25A

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2043194 RTD Temperature Probe, 3 in., 2 Wire
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2043194 RTD Temperature Probe, 3 in., 3 Wire
1455340 Fuse, 20A

1455341 Fuse, 1A
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1455341 Fuse, 1A
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1455340 Fuse, 20A
1455341 Fuse, 1A
2038018 Fuse, 0.25A
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| 2038011 | Outboard Bearing Set |

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| | |
|---|---|
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| 2035384 | Counter |
| 2036963 | Start/Stop Switch |
| 2035234 | Proximity Switch |
| 2036177 | Clamp Spring (2) |
| 2036309 | Thermal Circuit Breaker, 15A |

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| 2036963 | Start/Stop Switch |
| 2035234 | Proximity Switch |
| 2036177 | Clamp Spring (4) |
| 2036309 | Thermal Circuit Breaker, 15A |

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| 2036613 | Heater, 750W (1) |
| 2037722 | Stainless Steel Test Panel |
| 2037374 | Electronic Temperature Controller |
| 2037760 | Gear Pump |
| 2036777 | Snubber, Brass |
| 2036801 | Motor 115V, 60Hz, 1/3 hp |

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| 2036312 | Heater, 750W (1) |
| 2037722 | Stainless Steel Test Panel |
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| 2037760 | Gear Pump |
| 2036777 | Snubber, Brass |
| 2035206 | Motor 115/230V, 60Hz, 1/3 hp |
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| 2035179 | RTD Temperature Probe, 4 in. (1) |
| 2037924 | Ball Bearing (7) |
| 2037388 | Viton O-Ring |
| 2036948 | Viton O-Ring |
| 1455340 | Fuse, 20A |
| 1455341 | Fuse, 1A |
| 2037916 | Relay, Solid State, 4-32V DC, 20A |
| 2023581 | Temperature Controller, 100-240V, 2 out |

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| 2035769 | RTD Temperature Probe, 4 in. (1) |
| 2037314 | Relay, Solid State, 4-32VDC, 20A |
| 2023581 | Temperature Controller, 100-240V, 2 out |
| 1455340 | Fuse, 20A |
| 1455341 | Fuse, 1A |
| 2038018 | Motor Fan |
| 2037388 | Viton O-Ring |
| 2036948 | Viton O-Ring |

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| 2035658 | Ball Bearing (17) |
| 2037916 | Relay, Solid State, 4-32VDC, 20A |
| 2036988 | Motor, Gear, 115V, 60Hz, 83rpm |
| 1455340 | Fuse, 20A |
| 1455341 | Fuse, 1A |
| 2037388 | Viton O-Ring |
| 2036948 | Viton O-Ring |
| 2023581 | Temperature Controller, 100-240V, 2 out |

**2036193/2035471 Roll Stability Tester, 4-Unit, 220-240V, 50Hz and 60Hz**.....Page 156

| | |
|---|---|
| 2023581 | Temperature Controller, 100-240V, 2 out |
| 2035179 | RTD Temperature Probe, 4 in. (1) |
| 2038018 | Motor, Fan |
| 1455340 | Fuse, 20A |
| 1455341 | Fuse, 1A |
| 2037388 | Viton O-Ring |
| 2036948 | Viton O-Ring |
| 2038092 | Motor, Gear, 230V, 50Hz, 70rpm |

**2037727 High Temperature Wheel Bearing Tester, 115V, 60Hz** .....Page 161

| | |
|---|---|
| 2036956 | Heater, 1200W, 115V (1) |
| 2038018 | Fan Motor (1) |
| 2036301 | Cabinet Thermocouple (1) |
| 2036913 | Spindle Thermocouple (1) |
| 2036960 | Inboard Bearing Set |
| 2038011 | Outboard Bearing Set |
| 2037820 | Motor, modification |

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| | |
|---|---|
| 2035606 | Heater, 1200W, 230V (1) |
| 2038018 | Fan Motor (1) |

2038156 Fuse, 10A (5)
2037547 Fuse, 15A (5)
2037670 Fuse, 20A (5)
2036301 Cabinet Thermocouple (1)
2036913 Spindle Thermocouple (1)
2036960 Inboard Bearing Set
2038011 Outboard Bearing Set

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2023581 Temperature Controller, 100-240V, 2 out
2037286 Coil Heater, 1000W (2)
2036620 Vee Belt (60Hz) (1)
2037383 Motor
2277494 RTD Temperature Probe, 3 in. (1)

**2038190 Leakage Tendencies of Automotive Wheel Bearing Greases,220-240V, 60Hz**.....Page 160

2037334 Coil Heater, 1000W (2)
2036620 Vee Belt (60Hz) (1)
2277494 RTD Temperature Probe, 3 in. (1)
2037383 Motor
2023581 Temperature Controller, 100-240V, 2 out

**2036639 Leakage Tendencies of Automotive Wheel Bearing Greases, 220-240V, 50Hz**.....Page 160

2036642 Vee Belt (50Hz) (1)
2277494 RTD Temperature Probe, 3 in. (1)
2036483 Motor

**2035487 Series Low Temperature Torque Apparatus, 220-240V, 50Hz and 60Hz**.....Page 159

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2036339 Timing Belt (2)
2036085 Strain Gauge (2)
2036268 Small Bearing Set (2) For all D4693 models)
2037167 Large Bearing Set (2) For all D4693 models
2045565 Motor, 230V, 50/60Hz, 1/15 hp, 1.4A (1)

**1795189 Constant Temperature Air Cabinet, 115V**.....Page 165

2272145 Motor, 115V, 60Hz
2036817 Heater, 115V, 50W
2035101 Solenoid Valve, 115V (2)
2022441 RTD Temperature Probe
2347231 Temperature Controller, 100-240V

**1795190 Constant Temperature Air Cabinet, 220-240V** .....Page 165

2036359 Motor, 230V
2037443 Heater, 230V, 100W
2037837 Solenoid Valve, 230V (2)
2022441 RTD Temperature Probe
2347231 Temperature Controller, 100-240V
1455341 Fuse, 1A, Slo-blo

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2038206 Heater, 380 W, 115V (1)
2038136 Vee Belt, 22”
2038058 Vee Belt, 37”
2037784 Ball Bearing (2)
2035174 Test Bearing (3)
2035514 Thermoregulator
2038204 Flowmeter
2037383 Motor
2036007 O-ring (2)
2038216 Water Pump
2035826 Bearing Housing Gasket

**2037554 Water Washout Tester, 220-240V, 60Hz**.....Page 162

2037283 Heater, 380W, 220V (1)
2038136 Vee Belt, 22”
2038058 Vee Belt, 37”
2037784 Ball Bearing (2)
2035174 Test Bearing (3)
2036007 O-ring (2)
2035826 Bearing Housing Gasket
2038204 Flowmeter
2037383 Motor
2038216 Water Pump

**2036541 Water Washout Tester, 220-240V, 50Hz**.....Page 162

2037283 Heater, 380W, 220V (1)
2037909 Vee Belt, 37”, 50 Hz (1)
2036483 Motor, 110/220V, 50Hz

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2035726 Heater (cartridge), 750W, 120V (1)
2036506 Lamp (1)
2035698 Fuse, 1A
2037638 Temperature Probe, Type “K”, 3⁄16 dia x 4”
2023450 Test Tube 13x100mm (10)
2038200 Cup Support (10)
2347231 Temperature Controller, 100-240V
2035622 Solid State Relay, 25A, 90-240V

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2038103 Heater (cartridge), 750W, 240V (1)
2036506 Lamp (1)
2035698 Fuse, 1A
2037638 Temperature Probe, Type “K” (1)
2023450 Test Tube 13x100mm (10)
2038200 Cup Support (10)
2347231 Temperature Controller
2035622 Solid State Relay, 25A, 90-240V

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2035668 Test Tube with Indentations
2036830 Thermometer Cork
2035693 Bath Thermometer Cork
2035418 400mL Beaker
1792223 Wattstat, 115V
1455297 Heater Element, 1000W, 115V
2035302 Motor

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2036830 Thermometer Cork
2035693 Bath Thermometer Cork
2035418 400mL Beaker
2037952 Wattstat, 230V
2037718 Heater Element, 230V

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2035959 5" diameter Watch Glass (1)
2035539 Plunger Drop Cushion
2036500 Plunger Release Spacer
2036695 Plunger Release Lever (1)
2037353 Teflon Inserts

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2272145 Motor, 115V, 60Hz (1)
1790847 RTD Temperature Probe, 12 in.
2035179 RTD Temperature Probe, 4 in.
1455340 Fuse, 20A
1455341 Fuse, 1A
2038018 Fuse, 0.25A

**2036236 Saybolt Viscometer Bath, 220-240V** .....Page 16
2035298 Heater, 1200W, 230V (2)
2277537 Motor, 230V, 50/60Hz (1)
1790847 RTD Temperature Probe, 12 in.
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1455340 Fuse, 20A
1455341 Fuse, 1A
2038018 Fuse, 0.25A

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2035638 Capillary Gasket (8)
2037112 Thermocouple (3)
2037021 Motor, 115/230V 60Hz (1)
2037387 Coupling Spider (1)

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2035638 Capillary Gasket (8)
2037112 Thermocouple (3)
2036483 Motor, 115/230V, 50Hz (1)
2037387 Coupling Spider (1)

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2037879 Cylinder Gasket (2)
2035638 Capillary Gasket (1)

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2036457 Counter
2037021 Motor, 115/230V, 60Hz
2036483 Motor, 115/230V, 50Hz
2035901 Capillary Set, No. 1-8
2037112 Thermocouple (3)

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2037916 Solid State Relay, 4-32VDC, 20A
1186676 Stirrer Motor, 115V, 60Hz
2037927 Condenser Fan Motor, 115V
2036260 Heater (Cartridge), 500W, 115V
1455336 Fluorescent Lamp
1455340 Fuse, 20A
1455341 Fuse, 1A
2038018 Fuse, 0.25A
1790847 RTD Temperature Probe, 1/4" x 12"

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2037916 Solid State Relay
2035395 Condenser Fan Motor, 230V
2038238 Heater, 500W, 230V (2)
1790847 RTD Temperature Probe
1455336 Fluorescent Lamp, 50W, 120V
1455336 Fuse, 20A
1455341 Fuse, 1A
2038018 Fuse, 0.25A

**2037895 Digital Refrigerated Kinematic Viscosity Bath, 115V**.....Page 7
2036060 Solid State Relay
2037927 Condenser Fan Motor, 115V
2036260 Heater, 500W, 115V (2)
1790847 RTD Temperature Probe
1455336 Fluorescent Lamp, 50W, 120V
1455336 Fuse, 20A
1455341 Fuse, 1A
2038018 Fuse, 0.25A

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2330977 RTD Temperature Probe
2038018 Fuse, 0.25A
1455336 Fluorescent Lamp, 50W, 120V
2330864 Motor, 115V 60Hz
275-103-027 Temperature Controller, 100-240V



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**2037701/1794809 Series Kinematic Viscosity Baths, 220-240V, 50Hz/60Hz**.....Pages 4-5
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| | |
|---|---|
| 2330977 | RTD Temperature Probe |
| 2038018 | Fuse, 0.25A, Slo-blo |
| 1455336 | Fluorescent Lamp, 50W, 120V |
| 2037066 | Fan, 230V, 50/60Hz, 53CFM |
| 2035414 | Borosilicate Glass Jar, 12"x12" |
| 2035827 | Heater, 1250W, 230V |
| 2277537 | Motor, Modification, 230V |

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|---|---|
| 275-600-005 | Controller, PLC, 100-240 VAC |

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|---|---|
| 1793429 | Heater, 750W (1793429) (1) |
| 2037259 | Heater, 750W (2037259) (1) |
| 2272162 | RTD Probe Assembly |
| 2036281 | Electronic Temperature Control |

**2035184/2038074 Copper Strip Corrosion Test Bath, 4-Unit and 8-Unit, 220-240V**.....Pages 90, 91, 99

| | |
|---|---|
| 2037902 | Heater, 750W (1) |
| 2037519 | Heater, 750W (K25309) (1) |
| 2272162 | RTD Probe Assembly |
| 2036281 | Electronic Temperature Control |

**1408115 Test Tube Bath, 115V**.....Pages 90, 91, 131, 155

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|---|---|
| 2037505 | Heater, 750W, 115V (1) |
| 2035302 | Motor, 115V 60Hz |
| 2038197 | RTD Temperature Probe, 12 in. |
| 1455336 | Fuse, 20A |
| 1455341 | Fuse, 1A |
| 2037916 | Relay, Solid State, 4-32V DC, 20A |
| 2023581 | Temperature Controller, 100-240V, 2 out |

**1844091 Test Tube Bath, 220-240V** .....Pages 90, 91, 131, 155

| | |
|---|---|
| 2037902 | Heater, 750W, 230V (1) |
| 2038197 | RTD Temperature Probe, 12 in. |
| 1455336 | Fuse, 20A |
| 1455341 | Fuse, 1A |
| 2036998 | Motor, 230V 50/60Hz |
| 2037916 | Relay, Solid State, 4-32V DC, 20A |
| 2023581 | Temperature Controller, 100-240V, 2 out |

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|---|---|
| 1797531 | Heater, 750W (1) |
| 2037847 | Temperature Probe 500½ (1) |
| 2038018 | Motor, 230V 50/60Hz |
| 2037472 | Type "B" Controller |
| 2038094 | Potentiometer |

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|---|---|
| 2036914 | Heater, 750W (1) |
| 2037847 | Temperature Probe 500½ (1) |
| 2038018 | Motor (1) |
| 2037472 | Type "B" Controller |
| 2038094 | Potentiometer |

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|---|---|
| 2035913 | O-Ring, Buna 'N' (2) |
| 2035497 | Lucite Cylinder |
| 2036684 | Pressure Relief Valve, 1/4" |
| 2038088 | Neoprene Cushion (2) |

**2036834 Constant Temperature Hydrometer Bath, 115V**.....Page 50

| | |
|---|---|
| 2036497 | Heater, 500W (1) |
| 2038015 | Rheostat (1) |

**2037060 Constant Temperature Hydrometer Bath, 220-240V** .....Page 50

| | |
|---|---|
| 2036545 | Heater, 500W (1) |
| 2038015 | Rheostat (1) |

**2035475 Constant Temperature Hydrometer Bath, 115V** .....Page 50

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|---|---|
| 2036331 | Heater, 1500W (1) |
| 2037319 | Heater, 1000W (1) |
| 2038197 | RTD Temperature Probe, 12 in. |
| 2035179 | RTD Temperature Probe, 4 in. |
| 2043192 | Temperature Controller, 100-240V, 1 out |

**2036576 Constant Temperature Hydrometer Bath, 220-240V** .....Page 50

| | |
|---|---|
| 2037360 | Heater, 1500W (1) |
| 2038197 | RTD Temperature Probe, 12 in. |
| 2035179 | RTD Temperature Probe, 4 in. |
| 2043192 | Temperature Controller, 100-240V, 1 out |

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| | |
|---|---|
| 2036780 | Heater, 750W (1) |
| 1790847 | RTD Temperature Probe (1) |
| 2035302 | Motor (1) |
| 2035788 | Relay, Solid State, 4-32V DC, 20A |
| 2297930 | Temperature Controller, 100-240V |

**2035199 Thermometer Calibration Bath, 220-240V** .....Page 63

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|---|---|
| 2035104 | Heater, 750W (1) |
| 1790847 | RTD Temperature Probe (1) |
| 2036359 | Motor (1) |
| 2297930 | Temperature Controller, 100-240V |

**1452057 Smoke Point Lamp** .....Page 95

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|---|---|
| 2035412 | Replacement Window (1) |
| 2037965 | Scale (1) |

**1452061 Ramsbottom Carbon Residue Apparatus, 115V** .....Page 59

| | |
|---|---|
| 2035825 | Heater, 2400W (1) |
| 2037638 | Temperature Probe, Type "K", 3⁄16 dia x 4" |

1455341 Fuse, 1A
2038018 Fuse, 0.25A
2043192 Temperature Controller, 100-240V, 1 out

**1844092 Ramsbottom Carbon Residue Apparatus, 220-240V**.....Page 59
2037709 Heater, 2400W (1)
2037638 Temperature Probe, Type "K", 3⁄16 dia x 4"
1455336 Fuse, 20A
1455341 Fuse, 1A
2038018 Fuse, 0.25A
2037916 Relay, Solid State, 4-32V DC, 20A
2043192 Temperature Controller, 100-240V, 1 out

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332-014-001 Funnel

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2037260 Cartridge Heater, 650W (2)
2037638 Temperature Probe, Type "K", 4 in., (2)
1455336 Fuse, 20A
1455341 Fuse, 1A
2038018 Fuse, 0.25A
2037952 Wattstat (2)
2035344 Thermocouples (2)
2036459 Flowmeter (2)

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2038018 Motor, 115V 60Hz
2038197 RTD Temperature Probe, 12 in.
2035179 RTD Temperature Probe, 4 in.
1455336 Fuse, 20A
1455341 Fuse, 1A
2038018 Fuse, 0.25A
2043192 Temperature Controller, 100-240V, 1 out

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2038018 Motor (1)
2038197 RTD Temperature Probe, 12 in.
2035179 RTD Temperature Probe, 4 in.
1455336 Fuse, 20A
1455341 Fuse, 1A
2038018 Fuse, 0.25A
2043192 Temperature Controller, 100-240V, 1 out

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2035431 Sample Tube (Jacketed) (1)
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2035692 Inner Heater, 2000W (1)
2035179 RTD Temperature Probe, 4 in.
2038197 RTD Temperature Probe, 12 in.
1455336 Fuse, 20A
1455341 Fuse, 1A
2038018 Fuse, 0.25A
2037916 Relay, Solid State, 4-32 V DC, 20A
2043192 Temperature Controller, 100-240V, 1 out

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2037943 Belt (1)
2037681 Motor (1)
2035179 RTD Temperature Probe, 4 in.
1455336 Fuse, 20A
1455341 Fuse, 1A
2038018 Fuse, 0.25A
2043192 Temperature Controller, 100-240V, 1 out

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2035941 Heater, 1500W (1)
2037679 Motor, 230V 50Hz (1)
2035179 RTD Temperature Probe, 4 in., 600F
1455336 Fuse, 20A
1455341 Fuse, 1A
2038018 Fuse, 0.25A
2037916 Relay, Solid State, 4-32 V DC, 20A
2043192 Temperature Controller, 100-240V, 1 out

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2035941 Heater, 1500W (1)
2035179 RTD Temperature Probe, 4 in.
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2037916 Relay, Solid State, 4-32V DC, 20A
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2037638 Temperature Probe, Type “K”, 3⁄16 dia x 4”
1455336 Fuse, 20A
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2036624 Flowmeter
2037916 Relay, Solid State, 4-32V DC, 20A
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2277494 RTD Temperature Probe
2037916 Relay, Solid State, 4-32V DC, 20A
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1455341 Fuse, 1A

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2037040 Condenser (6)
1455336 Fuse, 20A
1455341 Fuse, 1A
2038018 Fuse, 0.25A
2037916 Relay, Solid State, 4-32 V DC, 20A
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1455336 Fuse, 20A
1455341 Fuse, 1A
2038018 Fuse, 0.25A
2037916 Relay, Solid State, 4-32V DC, 20A
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2037159 Heater, Outer, 750W (1)
2037404 Heater, Inner, 750W (1)
2022441 RTD Temperature Probe (1)
2024107 Rubber Stopper (2)
2347231 Temperature Controller, 100-240V
2038018 Motor, 115V 60Hz
2035622 Relay, Solid State, 90-240V, 25A
2038170 Relay, 120V
1455341 Fuse, 1A

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2024102 Heater, Outer, 750W (1)
2024104 Heater, Inner, 750W (1)
2024107 Rubber Stopper (2)
2347231 Temperature Controller, 100-240V
2022441 RTD Temperature Probe
2038018 Motor, 230V 50/60Hz
2035458 Relay, 240V
2036939 Relay, Solid State, 240V
1455341 Fuse, 1A

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2022441 RTD Temperature Probe (2)
2024102 Heater, Outer, 750W (1)
2024104 Heater, Inner, 750W (1)
2038018 Motor, 230V 50/60Hz (2)
2024105 Temperature Controller, 100-240V (2)
2035458 Relay, 240V (2)
2024106 Air Outlet Elbow (4)
2024107 Rubber Stopper (4)

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2022441 RTD Temperature Probe (2)
2038018 Motor, 230V 50/60Hz
2036939 Relay, Solid State, 240V (2)
2035297 Line Switch (2)
2024106 Air Outlet Elbow (4)
2024104 Heater, Inner, 750W (1)
2024102 Heater, Outer, 750W (1)
1340239 Cylinder and Holder Assembly (4)

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**1844127 Front View Distillation Apparatus, Right-Hand, 220-240V** ....
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**1418044 Front View Distillation Apparatus, Left-Hand, 115V** .....
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2059200 Brick Heater, 1250W (1)

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**1418045 Group 4 Distillation Apparatus, Right-Hand, 115V**....Page 55

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2059200 Brick Heater, 1250W (1)

**1844129 Group 4 Distillation Apparatus, Right-Hand, 220-240V**.....Page 55

2037083 Heater (condenser), 300W (1)
2283090 Brick Heater, 1250W (1)

**1418046 Group 4 Distillation Apparatus, Left-Hand, 115V** .....Page 55

2037447 Heater (condenser), 300W (1)
2059200 Brick Heater, 1250W (1)

**1844130 Group 4 Distillation Apparatus, Left-Hand, 220-240V**.....Page 55

2037083 Heater (condenser), 300W (1)
2059200 Brick Heater, 1250W (1)

**Main Part: 2289085 , 2050543 , 2052736, 2050544 Automatic Distillation Analyzer.**..... Page 57

2059213 Triac, 40 amp, Good
2330792 Cartridge Heater 300W, 240V
2276369 Heater Element
2258105 Ceramic Coil Support, set 4pc.

**1340240 Cold Filter Plugging Point Apparatus** .....Page 100

1456222 Pipette (1)
1456221 Filter (1)
2036446 O-ring (2)

**1186717 Cloud and Pour Point Chamber**.....Page 132

2036645 Copper Cup (4)
2036286 Thermometer Holder (4)
1865105 Disc (Cork) Bottom (4)
1865179 O-ring (4)
2038299 O-ring (4)

**1392029 Series Refrigerated Cloud and Pour Point,115V and 220-240V, 50Hz and 60Hz.**.....Page 132

**Model Numbers 1392029, 1402103, 1844133**

2261819 Copper Test Jacket
2036060 Relay
2035327 RTD Temperature Probe
2277498 Temperature Controller, 1 out
1455341 Fuse, 1A

**1340120 Series Refrigerated Cloud and Pour Point, 115V and 220-240V, 50Hz and 60Hz**.....Page 132

**Model Numbers 1340120, 1844134, 1844135**

2036060 Relay
2035327 RTD Temperature Probe
2277498 Temperature Controller, 1 out
1455341 Fuse, 1A

**2036226/2037337 Dual Extraction Apparatus, 115V and 220-240V.**.....Page 60

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2037027 Toggle Valve (1)
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2347231 Temperature Controller, 100-240V
2036747 Tachometer
2036851 Digital Pick Up
2036974 Flowmeter
2036168 Electronic Timer, 115V
2037798 Thermocouple
2036593 Separatory Funnel, 500mL
2042836 Cartridge Heater, 300W, 240V
2330975 Fuse, 3.15A
2037758 Fuse, 2A (1)
1455341 Fuse, 2A (2)

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2038261 Ring Heater, 200W (4)
2038119 Band Heater, 600W (1)
2035155 O-ring (24)
2035064 Oxidation Tubes and Absorption Tubes 12 Sets (2 per set)
2277494 RTD Temperature Probe, 3 in., 2 Wire
2043194 RTD Temperature Probe, 3 in., 3 Wire
1455336 Fuse, 20A
1455341 Fuse, 1A
2038018 Fuse, 0.25A

**2036835 Cigre Bath, 220-240V** .....Page 126

2036072 Ring Heater, 200W (4)
2037304 Band Heater, 600W (1)
2035155 O-ring (24)
2035064 Oxidation Tubes and Absorption Tubes 12 Sets (2 per set)

2277494 RTD Temperature Probe, 3 in., 2 Wire
2043194 RTD Temperature Probe, 3 in., 3 Wire
1455336 Fuse, 20A
1455341 Fuse, 1A
2038018 Fuse, 0.25A

**2022433 Oxidation Bomb** .....Page 114

2036034 Silicone O-ring (qty. depends on usage)
2038254 Valve (1)

**1844147/1844148 2-Unit RBOT Bath, 220-240V, 50Hz and 60Hz**.....
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2038049 Control Heater, 1000W (1)
2037396 Continuous Heater, 1000W (1)
2035304 Control Heater, 750W (1)
2022439 O-Ring, Viton (2)
2022440 Drive Shaft Seal (8)
2035635 Chain Kit (1)
2035282 Switch
2035658 Ball Bearing (2)
2038197 RTD Temperature Probe, 12 in.
2035179 RTD Temperature Probe, 4 in.
1455336 Fuse, 20A
1455341 Fuse, 1A
2038018 Fuse, 0.25A

**1844149/1844150 3-Unit RBOT Bath, 220-240V, 50Hz and 60Hz**.....
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2036173 Heater, 1000W (2)
2035235 Heater, 750W (1)
2037338 Vee Belt (1)
2022439 O-Ring, Viton (3)
2022440 Drive Shaft Seal (12)
2036807 Chain Kit (1)
2035658 Ball Bearing (2)
2038018 Motor, 1/2 hp
2035282 Switch
2038197 RTD Temperature Probe, 12 in.
2035179 RTD Temperature Probe, 4 in.
1455336 Fuse, 20A
1455341 Fuse, 1A
2038018 Fuse, 0.25A

**1844151/1844153 4-Unit RBOT Bath, 220-240V, 50Hz and 60Hz**.....
.....Page 116

2035346 Heater, 1000W (4)
2037338 Vee Belt (1)
2022439 O-Ring, Viton (4)
2035658 Ball Bearing (4)
2022440 Drive Shaft Seal (16)
2036638 Chain Kit (1)
2038018 Motor, 1/2 hp
2035282 Switch
2038197 RTD Temperature Probe, 12 in.
2035179 RTD Temperature Probe, 4 in.
1455336 Fuse, 20A
1455341 Fuse, 1A
2038018 Fuse, 0.25A

**2023232/2038954 Automatic Pensky-Martens Closed Cup Flash Point Tester**.....Pages 33

2038956 Stirring Connection Cable
2038957 Detection Cable
2038958 PT 100 Probe
2038959 Electric Ignitor (consumable)
2038960 Roll of Printer Paper (consumable)

**2277510/2275356 Automatic Cleveland Open Cup Flash Point Tester** .....Pages 33

2277501 Heating Element 1000W
2277508 Electric Ignitor (consumable)
2277509 Roll of Printer Paper (consumable)
2277504 Insulated Plate-Mobile
2277505 PT 100 Probe

**1790893 Portable Octane Analyzer**.....Pages 102

2035125 Sample Holder
2023302 Serial to USB adapter
1790903 Sample holder covers, 12

**2025316 Digital Penetrometer** .....Pages 24, 25, 27

1793485 Fuse Holder and Cap
1793486 Fuse, 4A
1793487 Battery, 12V (1)
1793483 Light Assembly

**2331496 Automatic Pour Point System** .....Pages 133

2294303 Pour Point glass cell
2331050 PT100 product w/ connector (white)
2294304 PT100 detection w/ connector (brown)

**2331023 Automatic Cloud/Pour Point System** .....Pages 133

2331045 Fiber optic for Cloud Point
2331044 PT100 product w/ connector (blue)
2294304 PT100 detector w/ connector (brown)
2331048 Calibrated Glass Cell for Cloud Point (silver bottom)

**2346891 Automatic Cold Filter Plugging Point System** ...Pages 101

1797292 CFPP calibrated glass cell
1797293 “O” ring for CFPP test jar
1797298 PT100 product w/ connector
1797299 Calibrated aspiration pipette
1797301 Filter assembly
1797302 Filter
1797303 “O” ring (small) for CFPP filter
1797304 “O” ring for CFPP filter

**2281754 Automatic Freezing Point System**.....Pages 97

2041594 Fiber optic for Freezing point
2041597 Removable freezing glass cell

**400 Thermal Oxidation Tester**

| | |
|---|---|
| 2289086 | Beaker Cover |
| 2289087 | Heater Tube Test Assembly |
| 2289088 | Aeration Line Assembly |
| 2289089 | Sample Output Line Assembly |
| 2289090 | Heater Tube Input Line Assembly |
| 2289091 | Heater Tube Output Line Assembly |
| 2289092 | Pre-Filter Assembly |
| 2289093 | Hex Wrench |
| 2289094 | Thermocouple Fuel Sample |
| 2289095 | Thermocouple Heater Tube |
| 2289096 | Tube Reader Lightbulb (3/pkg) |
| 2329735 | Replacements Screw Set (3 pre-filter screws, 4 bus bar screws) |
| 2289099 | Heater Tube Hex Nut |
| 2044598 | ASTM D3241 Color Standard |
| 2308174 | Lead Calibration Cup Assembly |
| 2308175 | Color Inkjet Printer |

**Thermal Fouling Tester (FT2)**

| | |
|---|---|
| 2316979 | Sight-Glass O-Ring Kit |
| 2316980 | Heater Tube Thermocouple |
| 2316981 | Inlet or Outlet Thermocouple |
| 2316982 | Line Connection O-rings (25/pkg) |
| 2316983 | Replacement Reservoir Jacket |
| 2316984 | Replacement Oven Tube Holder |
| 2316985 | Heater Tube, 316 Stainless Steel (12/box) |

**FT2 with the Ultimate Performance for Turbine Oil Thermal Stability Testing**

| | |
|---|---|
| 2316976 | Heated Test Supply/Return Lines Kit |
| 2316977 | Remote Emergency E-Stop |
| 2316978 | Pump Heater Jacket |
| 2316980 | Heater Tube Thermocouple |
| 2316981 | Inlet or Outlet Thermocouple |
| 2316982 | Line Connection O-Rings (25/pkg) |
| 2316983 | Replacement Reservoir Jacket |

**JFTOT III**

| | |
|---|---|
| 1000768 | Supprt SCRN SS F/MICR-SYR |
| 1422314 | Filter Paper 32cm, 100/pk |
| 1429865 | Desiccant, Drierite (with Indicator) 1 lb/btl, 12btl/cs |
| 1433561 | Kaydry Ex-l 3-ply 12x12 119/pk |
| 1436791 | Nut Male Plastictight 1/8In |
| 1443649 | Wash Bottle LDPE 1000mi 2/pk 6 pks/cs |
| 1451004 | Beaker Griffin 1000mi 6/pk, 4pk/cs |
| 1455381 | Heater Test Section for JFTOT |
| 1455766 | Heater Tube and Filter Kit, JFTOT, 10/pk |
| 1455831 | Bushings Ceramic, Insulating, 4/pk |
| 1455877 | Prefilter Kit for JFTOT /kit |
| 1456178 | O-Ring Line Connector, Alcor 25/pk |
| 1721392 | Fuse, 3/4A 250V, Slo-Blo |
| 1721927 | Calibration Standard Lead, 10/pk |
| 1721934 | Bottle & Tube Assy |
| 1722439 | Tray, SS 10x12x2-1/2 In |
| 1722389 | Aluminum Foil 18 in x 8.33 Yard Roll/ea |
| 1722438 | Syringe, Bulb-Rubber 2 oz. Sterile 50/cs |
| 1790758 | Hex Driver 5/32 In. 6 ea/cs |
| 1790762 | Glove, Latex Exam Powdered 100/Pk 10 pks/cs |
| 1790806 | Hook, Angle 5 In. Length |
| 2021505 | Grease, Silicone Bottle |
| 2041403 | Fuse, 3Ag, 250V, 8Amp, Fast |
| 2041404 | Fuse, 3Ag, 250V, 0.5 Amp, Fast |
| 2047464 | Fuse, 4Amp, 250V, Fast |
| 2047465 | Fuse, 1.5amp, 250v, Fast |
| 2047466 | Fuse, T6.3amp, 250v, Slow |
| 2053492 | Filter, Inlet, 10mm, Ss, 1/8 in , 2 ea/st |
| 2246970 | Filter, Charcoal, .75x3.75x10.625 |
| 2246972 | Thermocouple Type K, Sample Vessel, JFTOT III |
| 2269727 | T/C Type K Sample Vessel JFTOT |
| 2280926 | Prefilter Assy |
| 2280927 | Scrubber Dririte 1/8" Tube -3/16 H |
| 2023245 | Screw, Cap, Upper Bus |

**Model 230 and 240**

| | |
|---|---|
| 2282291 | Reservoir Assy Fuel |
| 2278554 | Time Reactor Assy. JFT-240 |
| 2041725 | Air Filter Dryer With Silica Gel |
| 2021505 | Grease, Silicone Bottle |
| 2021804 | Lead, NMP-SMP Adaptor |
| 2022687 | Reservoir Assembly, , Water, JFT |
| 2022919 | Alcor 'O' Ring, Drive Pump Column |
| 1791094 | Fuse, 2 Amps, 250v |
| 1792970 | Water Pump Assy, 24vdc |
| 1793159 | Sliding Scale Assy., JFTOT 230 |
| 1793243 | Printer Kit (120vac) |
| 1793244 | Dot Matrix Printer with Cable |
| 1793245 | Printer Ribbon (EPSON LX-810) |
| 1794021 | Silica Gel 1oz |
| 1795137 | Piston for JFTOT |
| 1790762 | Glove, Latex Exam Powdered 100/pk 10 pks/cs |
| 1722438 | Syringe, Bulb-Rubber 2 oz. Sterile 50/cs |
| 1722439 | Tray, SS 10X12X2-1/2 in |
| 1722442 | Autocal Assy , Lead |
| 1721934 | Bottle & Tube Assy |
| 1721927 | Calibration Standard Lead, 10/pk |
| 1721945 | Filter Aerator Holder |
| 1450131 | Beaker Polyprop 1000ml 100/cs |
| 1722058 | Reservoir Base Stand JFT-230 |
| 1721768 | Thermometer, Blue Spirit, -35 tO 50 DEG C |
| 1721924 | Autocal Assy, TIN |
| 1455912 | Fitting (Quick Connect) |
| 1718172 | Aeration (Plastic) Tubing |
| 1718908 | Clamp, Spring NN |
| 1718909 | Line,Tidr Hous to Blkhda |
| 1718910 | Insulation, Time Delay A |
| 1717402 | Line, Outlet Assy, Heater Section |

| | |
|---|---|
| 1717403 | Prefilter Assy, JFTOT |
| 1717408 | Air Pump Assy with Lead and Connector. 24vdc |
| 1717624 | Fuse, 0.75 Amp, Fast |
| 1717625 | Fuse, 6.0 Amp 3Ag Normal BLO |
| 1717626 | Fuse, 6.25 Amp Time Delay |
| 1717627 | O Ring, Water Reservoir |
| 1717946 | Calibration Standard, TIN |
| 1455877 | Prefilter Kit for JFTOT /KIT |
| 1455909 | Gearbelt, 3/8 Pitch |
| 1455910 | Residue Trap Gasket-Viton |
| 1455831 | Bushings Ceramic, Insulating, 4/pk |
| 1455766 | Heater Tube and Filter Kit, JFTOT, 10/pk |
| 1455381 | Heater Test Section for JFTOT |
| 1455759 | Water Pump Repair Kit, JFTOT |
| 1455760 | Reservoir Outlet Line Assy, JFTOT |
| 1455761 | Reservoir Water, Vent Line Assy, JFTOT |
| 1455762 | Reservoir Water, Inlet Line Assy, JFTOT |
| 1446478 | Residue Trap Jar, Bottle, Clear, Straight Side, 4 oz. 24/cs |
| 1442342 | Brush Cyl Nyl, 12/pk, 144/cs |
| 1433561 | Kaydry Ex-L 3-Ply 12x12 119/pk |
| 1422314 | Filter Paper 32cm, 100/pk |
| 1171371 | Thermocouple Heater Tube |
| 1417946 | Aeration Tube Gas Dispersion Tube 12mm Coarse |
| 1420503 | Forceps All Coated TFE 11cm |
| 1074458 | Seal Reservoir Piston-TEFLON |
| 1123388 | Fuel Reservoir O-Ring (JFT-230) |

**MCRT 160**

| | |
|---|---|
| 1144242 | Sample Low Carbon Residue 0.3% |
| 1446478 | Residue Trap Jar, Bottle, Clear, Straight Side, 4 oz. 24/cs |
| 1455051 | Vial 1/2 Dram (2 mi) Clear Cell Pack, 144/ pk |
| 1455540 | Sample Low Carbon Residue 10.6% |
| 1455541 | Sample Low Carbon Residue 1.5% |
| 1455910 | Residue Trap Gasket-Viton |
| 1718061 | Vial, 4 Dram, Mcrt, 144/bx, 4 pk/cs |
| 1717419 | Power Supply, 24vdc, 2.5A |
| 1717421 | Relay, Solid State, SSR2, 25A, 240vac |
| 1719633 | Teflon Tape Pipe Seal NN |
| 1719712 | Conn,Male1/8T-1/8P NN |
| 1720294 | Nut Brass 1/4T B-402-1 NN |
| 1456009 | Refrence Sample High Carbon Residue 24% |
| 1721948 | Basket for 1/2 Dram Vial |
| 1721949 | Basket for 4 Dram Vial |
| 1721942 | Basket Handle |
| 1722915 | Brush, Stiff Bristle 1/2 X 3 X 12 inch |
| 1793006 | 6mm Tube Adapter |
| 1793007 | Barbed Hose Adapter, 1/4” (6.3mm) |
| 1793008 | Allen Wrench, .035” |
| 1793009 | Fuse, 10Amp Fast for 120v Only |
| 2044735 | Fuse, 5Amp Fast for 230v Only |
| 2279603 | Union, 1/4”T Br Bulkhd B-400-61, 3 |
| 2286558 | Shell Vial,w/o Closure 1 Dram, 144/pk, 1828/cs |
| 2023306 | Insulation, Oven, Bottom (2 pc Set) |

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